IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT Application of Mills

Group Art Unit: 2624

Application Ser. No. 09/220,970

Examiner: W. Chen

Filed: 12/23/98

For: A METHOD AND SYSTEM FOR PATTERN RECOGNITION AND PROCESSING

* * * * *

September 21, 2007

APPEAL BRIEF

Hon. Asst. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

This is now the third appeal Appellant has had to file in this application in response to the erroneous rejection of claims 51-322 for lack of utility under 35 U.S.C. § 101, this after the case had been previously reviewed and found to be allowable by six different Examiners. Appellant is absolutely appalled by the mistreatment he has received in the examination of this case, which has become more about persecuting Appellant, Dr. Randell L. Mills, than prosecuting his application.

Not only has the present Examiner failed to follow the lead of those six Examiners who found the present claims patentable, but he has disregarded the Appeals Board's explicit instructions set forth in its March 22, 2005 Decision rendered in Appellant's second filed appeal.[1] In that Decision, the Board basically agreed with

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[1] Appellant filed a first appeal after his application had been suspiciously transferred to a seventh Examiner, whose lack of qualifications resulted in a specious rejection of the claims. That Examiner also candidly admitted that he was so busy training other Examiners that he didn't have time to adequately study and comprehend the application. [See Appellant's Appeal Brief dated April 3, 2001] Rather than respond to that first appeal, the PTO intensified its harassment of Appellant by transferring his application to the eighth and present Examiner. Incredibly, the rejections that followed were even more extreme, relying primarily on prior art technology that Appellant's specification expressly teaches against using, which art rejections the Board dismissed in Appellant's second appeal.

Appellant that the § 101 rejections were off-base—it also withdrew the prior art rejections of record—and remanded this application to the Examiner for consideration of an amendment to the specification that would be (and was) filed containing definitions for two claim terms: "Fourier Series in Fourier Space" and "Probability Operand." [See March 22, 2005 Decision at p. 12.] Having been fully briefed in Appellant's second appeal regarding the mishandling of the present application, the Board plainly stated:

> This application, by virtue of its "special" status, requires immediate action by the examiner. *See* MPEP § 708.01(d). The Board of Patent Appeals and interferences must be informed promptly of any action affecting the appeal in this case, including reopening of prosecution, allowance and/or abandonment of the application. [March 22, 2005 Decision at p. 12 (emphasis in original).]

The Examiner blatantly disobeyed the Appeals Board's instructions, as he failed to act immediately and to promptly inform the Board of what action was being taken. Rather, the Examiner delayed for over a year and a half (almost 19 months)—despite repeated urgings to act by Appellant in numerous telephone conferences—before finally issuing his latest Office Action dated December 18, 2006. Worse yet, in rejecting the present claims under § 101 for lack of utility, the Examiner violated the Board's further admonition that he properly explain the basis for those rejections:

> Additionally, as to claims 307-322, rejected under 35 U.S.C. § 101 as being drawn to non-statutory subject matter, if the examiner intends to repeat the rejection, the examiner should point how the examiner considers independent claims 307 and 313 to be data structures, per se, in view of the limitations "A data structure in a memory . . . with information stored in said memory . . . a plurality of memory data objects . . . to thereby allow recognition of characteristics of said newly presented information . . . in said information stored in said memory" of claim 307, and "A data structure in memory . . . comprising data stored in the memory ... to achieve recognition of a patter in information" as recited in claim 313." [*See* pp. 11-12 of the Board's May 22, 2005 Decision.]

Here again, the Examiner failed to even attempt to comply with the Board's instructions, leaving Appellant to file this third appeal on basically the same grounds as his previous appeal from the same rejection that has already been overturned by the Board.

In view of these latest extreme actions directed against Appellant, he once again appeals to this Board to put a stop to the continued abuse of the examination process in this case. For the many reasons explained in more detail below, and in the Appeal Briefs submitted in connection with Appellant's first and second filed appeals, the latest rejections of claims 51-322 under § 101, as well as those under § 112, first paragraph, are wholly without merit and should be withdrawn so that these claims can once more be allowed.

(i) Real Party in Interest:

This application is wholly owned by the inventor, Dr. Randell L. Mills, who is the Appellant.

(ii) Related Appeals and Interferences:

The Board's previous Decision mailed March 22, 2005 will have a bearing on the pending appeal. A copy of that Decision is attached hereto.

(iii) Status of Claims:

Claims 51-322 are pending in this application.
Claims 1-50 have been cancelled.
Claims 51-322 stand rejected.
The rejection of claims 51-322 is appealed.
Please refer to the Claims Appendix for a copy of the claims under appeal.

(iv) Status of any Amendment Filed Subsequent to Final Rejection:

No amendments have been filed subsequent to the pending final rejection.

A Notice of Appeal was filed May 21, 2007 along with the appropriate fee.

(v) Summary of Claimed Subject Matter:

An embodiment of the present invention is concisely explained in easy to follow flow charts illustrated in Figs. 1-5 and 18-21E of the specification. To the extent further explanation is required, the present invention will be described with reference to these flow charts without being limited thereto.

Only the independent claims are discussed in this section with reference to the Figures. A complete copy of each appealed claim and a reading of each claim on the specification are set forth in Exhibit (xi). Appellant emphasizes that this reading of the claims in no way limits the claims to any particular embodiment disclosed in the specification or imposes any other restriction on the scope of the claims.

As recited in claim 51, the invention provides a method for recognizing a pattern in information comprising data, the method comprising:

inputting data;

(Fig. 2, "Data", described at page 8, line 20)

encoding data as parameters of a plurality of Fourier components in Fourier space;

(Fig. 2, processor (22), described at page 8 lines 21-22)

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

(Fig. 2 described at page 13 lines 4-6)

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

(Fig. 2, filter 34, described at page 13 lines 7-10)

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

(Fig. 2, filter 34, described at page 13 lines 7-10)

determining a spectral similarity between said modulated Fourier series and another Fourier series;

(Fig. 2, spectral similarity analyzer 36, described at page 13 lines 10-15)

determining a probability expectation value based on said spectral similarity;

(Fig. 2, probability expectation analyzer 38, described at page 13 lines 14-17)

generating a probability operand based on said probability expectation value;

(Fig. 2, probability operand generator 40, described at page 13 lines 17-20)

selecting a desired value for said probability operand, wherein recognition of a pattern in said information is obtained when said probability operand having said desired value; and

(Fig. 2, described on page 13, lines 20-26, in this disclosed example, the desired probability operand value was selected to be one, but can be any value desired by the user)

outputting a recognized pattern.

(Fig. 2, described on page 13, lines 20-26, when the desired probability operand value is a desired value, a pattern is recognized and can be outputted as recognized. In the particular disclosed example on page 13, the recognized pattern is outputted in a manner such that the Fourier series is combined with said another Fourier series to a provide string of recognized information represented by the Fourier series (which is recited in dependent claim 52). The recognized string can be increased in size as desired by repeating the steps of the method. Recognition is also referred to as "association" or "associated information" in the application.)

Claim 118 provides a method for recognizing a pattern in information, the method comprising:

inputting information;

(Fig. 2, "Data", described at page 8, line 20)

representing the information as a plurality of Fourier series in Fourier space;

(Fig. 2, processor (22), described at page 8 lines 21-22)

forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters and by coupling the filtered Fourier series based on a probability distribution, wherein when at least two of the Fourier series have been associated recognition of a pattern in the information is achieved; and

(Fig. 2, described on page 13, lines 5-26)

outputting a recognized pattern in the information.

(Fig. 2, described on page 13, lines 20-26, when the desired probability operand value is a desired value, a pattern is recognized and can be outputted as recognized. In the particular disclosed example on page 13, the recognized pattern is outputted in a manner such that the Fourier series containing the recognized pattern is combined with said another Fourier series to a provide string of recognized information represented by the Fourier series (which is recited in dependent claim 120). The recognized string can be increased in size as desired by repeating the steps of the method.)

An example of claim 127 is disclosed on page 16, line 16 to page 18, line 21. The italicized reference numbers refer to Fig. 4. Claim 127 provides a method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the method comprising:

a.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

(string memory section 44)

b.) selecting at least two filters from a selected set of filters;

(two filters 48 and 50 from a set of filters 52)

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

(high level memory section 54)

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

(spectral similarity analyzer 56)

h.) determining a probability expectation value based on the spectral similarity;

(probability expectation value analyzer 58)

i.) generating a probability operand based on the probability expectation value;

(probability operand generator 60)

j.) repeating steps b-i until the probability operand has a desired value, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

(Processor 42 determines the value of the probability operand. The desired value in the disclosed example on pages 16-18 is one, but can be any value as desired by the user. When the probability operand determined by processor 42 is equal to the desired value a pattern has been recognized.)

k.) storing the summed Fourier series to an intermediate memory;

(intermediate memory section 62)

l.) removing the selected filters from the selected set of filters to form an updated set of filters;

(set of filters 52)

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;

(*selecting updated filter 62 from set of filters 52)*

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;

(intermediate memory section 62)

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;

(high level memory section 54)

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability

operand has a desired value a pattern in information has been recognized an order formatted pattern in the information has been established;

(processor 42)

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

(processor 42)

aa.) storing the Fourier series in the intermediate memory in the high level memory. *(high level memory section 54)*

An example of claim 156 is disclosed at page 7, lines 11-33, and page 23, lines 8-21. The italicized reference numbers refer to Fig. 1. Claim 156 provides a system *(10)* for recognizing a pattern in information comprising data and establishing an order formatted pattern in information, the system comprising:

an input layer *(12)* that receives data representative of physical characteristics or representations of physical characteristics within an input context of the physical characteristics and transforms the data into a Fourier series in Fourier space wherein the input context is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies;

a memory *(20)* comprising a set of initial ordered Fourier series;

an association layer *(14)* that receives a plurality of the Fourier series in Fourier space from the memory, recognizes a pattern in information represented by the Fourier series, forms a string comprising a sum of Fourier series, and stores the string in memory;

a string ordering layer *(16)* that receives the string and at least one ordered Fourier series from the memory, orders the Fourier series contained in the string by establishing an order formatted pattern in information to form an ordered string, and stores the ordered string in memory; and

a predominant configuration layer *(18)* that receives multiple ordered strings from the memory, forms complex ordered strings from the ordered strings, stores the complex ordered strings to the memory, and activates the components of any of the layers of the system to recognize a pattern in information and establish an order formatted pattern in information.

An example of claim 157 is disclosed at page 21, line 9 to page 22, line 33. The italicized reference numbers refer to Fig. 5. Claim 157 provides a method of recognizing a pattern in information, the method comprising:

a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on an activation rate of the corresponding component;
(probability parameter generator 66)

b.) storing the activation probability parameter in memory *(20)*;

c.) generating a probability operand based on the activation probability parameter;
(activation probability operand generator 70)

d.) if said probability operand is a desired value, activating any component of one or more of the group consisting of an input layer *(12)*, an association layer *(14)*, a string ordering layer *16)*, and a predominant configuration layer *(18)*, the activation being based on the activation probability parameter, wherein a pattern in information is recognized when said probability operand is said desired value;

e.) repeating steps a-d until a pattern is recognized in the information.

An example of claim 160 is disclosed on page 8, lines 19-23, page 13, lines 1-26, and page 23, lines 8-21, and Fig. 2. Claim 160 provides a computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information comprising data, the computer program comprising instructions which, when executed by a computer, perform the steps of:

encoding data as parameters of a plurality of Fourier components in Fourier space;

(Fig. 2, processor (22), described at page 8 lines 21-22)

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

(Fig. 2 described at page 13 lines 4-6)

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

(Fig. 2, filter 34, described at page 13 lines 7-10)

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

(Fig. 2, filter 34, described at page 13 lines 7-10)

determining a spectral similarity between said modulated Fourier series and another Fourier series;

(Fig. 2, spectral similarity analyzer 36, described at page 13 lines 10-15)

determining a probability expectation value based on said spectral similarity;

(Fig. 2, probability expectation analyzer 38, described at page 13 lines 14-17)

generating a probability operand based on said probability expectation value; and

(Fig. 2, probability operand generator 40, described at page 13 lines 17-20)

selecting a desired value for said probability operand, wherein recognition of a pattern in said information is obtained when said probability operand having said desired value.

(Fig. 2, described on page 13, lines 20-26, in this disclosed example, the desired probability operand value was selected to be one, but can be any value desired by the user. When the desired probability operand value is a desired value, a pattern is recognized. In the particular disclosed example on page 13, the Fourier series containing the recognized pattern is combined with said another Fourier series to a provide string of recognized information represented by the Fourier series (which is recited in dependent claim 162). The recognized string can be increased in size as desired by repeating the steps of the method. Recognition is also referred to as "association" or "associated information" in the application.)

An example of claim 228 is disclosed on page 8, lines 21-22, page 13, lines 5-26, and page 23, lines 8-21. Claim 228 provides a computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

representing the information as a plurality of Fourier series in Fourier space; and

(Fig. 2, processor (22), described at page 8 lines 21-22)

forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters and by coupling the filtered Fourier series based on a probability distribution, wherein when at least two of the Fourier series have been associated recognition of a pattern in the information is achieved.

(Fig. 2, described on page 13, lines 5-26, when the desired probability operand value is a desired value, a pattern is recognized. In the particular disclosed example on page 13 the Fourier series containing the recognized pattern is combined with said another Fourier series to a provide string of recognized information represented by the Fourier series (which is recited in dependent claim 230). The recognized string can be increased in size as desired by repeating the steps of the method.)

An example of claim 237 is disclosed on page 16, line 16 to page 18, line 21, and page 23, lines 8-21. The italicized reference numbers refer to Fig. 4. Claim 237 provides a computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

(string memory section 44)

b.) selecting at least two filters from a selected set of filters;

(two filters 48 and 50 from a set of filters 52)

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

(high level memory section 54)

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

(spectral similarity analyzer 56)

h.) determining a probability expectation value based on the spectral similarity;

(probability expectation value analyzer 58)

i.) generating a probability operand based on the probability expectation value;

(probability operand generator 60)

j.) repeating steps b-i until the probability operand has a desired value, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

(Processor 42 determines the value of the probability operand. The desired value in the disclosed example on pages 16-18 is one, but can be any value as desired by the user. When the probability operand determined by processor 42 is equal to the desired value a pattern has been recognized.)

k.) storing the summed Fourier series to an intermediate memory;

(intermediate memory section 62)

l.) removing the selected filters from the selected set of filters to form an updated set of filters;

(set of filters 52)

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;

(selecting updated filter 62 from set of filters 52)

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;

(intermediate memory section 62)

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;

(high level memory section 54)

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability operand has a desired value a pattern in information has been recognized an order formatted pattern in the information has been established;

(processor 42)

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

(processor 42)

aa.) storing the Fourier series in the intermediate memory in the high level memory.

(high level memory section 54)

An example of claim 266 is disclosed on page 21, line 9 to page 22, line 33 and page 23, lines 8-21, referring to Fig. 5. Claim 266 provides a computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information and establishing an order formatted pattern in information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) recording ordered strings comprising Fourier series to a high level memory, said Fourier series representing information;

(high level memory section 54)

b.) forming association between Fourier series of the ordered strings to form complex strings and recognizing a pattern in information;

(association layer 14)

c.) ordering the Fourier series of the complex strings to form complex ordered strings representing recognized information and establishing an order formatted pattern in information, and

(string ordering layer 16)

d.) storing the complex ordered strings to the high level memory.

(complex ordered string section 72, high level memory section 54)

An example of claim 267 is disclosed on page 21, line 9 to page 22, line 33 and page 23, lines 8-21, referring to Fig. 5. Claim 267 provides a computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information comprising data and forming a predominant configuration, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on an activation rate of the corresponding component;

(activation probability parameter generator 66)

b.) storing the activation probability parameter in memory;

(memory 20)

c.) generating a probability operand based on the activation probability parameter;

(activation probability operand generator 70)

d.) if said probability operand is a desired value, activating any component of one or more of the group consisting of an input layer, an association layer, a string ordering layer, and a predominant configuration layer, the activation being based on the activation probability parameter, wherein recognition of a pattern in information is achieved when said probability operand is said desired value, and

(input layer 12, association layer 14, string ordering layer 16, predominant configuration layer 18, while the desired value is one in the disclosed example, any suitable value can be selected by the user)

e.) repeating steps a-d to form a predominate configuration.

An example of claim 270 is disclosed at page 7, lines 11-33, and page 23, lines 8-21. The italicized reference numbers refer to Fig. 1. Claim 270 provides a computer program product for recognizing a pattern in information for use in a computer including a central processing unit and a memory, the memory maintaining a set of initial ordered Fourier series, the computer program product comprising:

a computer readable medium;

program code means embodied in the computer readable medium, the program code means comprising:

means for receiving data representative of physical characteristics or representations of physical characteristics within an input context of the physical characteristics and transforming the data into a Fourier series in Fourier space wherein the input context is

encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies;

(input layer 12)

means for receiving a plurality of the Fourier series in Fourier space including at least one ordered Fourier series from the memory, forming a string comprising a sum of the Fourier series and storing the string in memory;

(association layer 14, memory 20)

means for retrieving the string from memory, ordering the Fourier series contained in the string to form an ordered string and storing the ordered string in memory; and

(string ordering layer 16)

means for retrieving multiple ordered strings from the memory, forming complex ordered strings from the ordered strings and storing the complex ordered strings to the memory.

(predominant configuration layer 18)

An example of claim 271 is disclosed at page 1, line 32 to page 2, line 14 and page 21, line 9 to page 23, line 36. The italicized reference numbers refer to Fig. 5. Claim 271 provides a method of recognizing a pattern in information comprising data and establishing an order formatted pattern in information, the method comprising:

encoding inputted data as a plurality of Fourier components in Fourier Space and form a plurality of Fourier series from said Fourier components, said Fourier series representing information comprising data and input context;

associating said plurality of Fourier series with each other according to spectral similarities between said plurality of Fourier series to form a string, said string being a sum of associated plurality of Fourier series;

ordering said plurality of Fourier series within said string based on relative degree of association of order formatted subsets of said string with relevant aspects of a standard ordered string;

(predominant configuration layer 18 receives ordered strings from the high level memory section 54 and form more complex ordered strings)

assigning an activation probability parameter to each of said plurality of Fourier components and to each of said plurality of Fourier series to produce a predominant configuration string, generating a probability operand based on said activation probability parameter, said probability operand determining whether an activation of any one of said plurality of Fourier component and said plurality of Fourier series is to cause an activation of an associated another of said plurality of Fourier components and said plurality of Fourier series from said ordered string; and

(the predominant configuration layer 18 includes an activation probability parameter generator 66)

storing said predominant configuration string in a memory, thereby a pattern in newly inputted information can be recognized.

(memory 20)

An example of claim 281 is disclosed at page 7, lines 11-33 and page 23, lines 8-26. The italicized reference numbers refer to Fig. 1. Claim 281 provides a system *(10)* for recognizing a pattern in information comprising data, the method comprising:

an input layer *(12)* operable to receive said data, and to encode said received data as parameters of a plurality of Fourier series in Fourier space, said plurality of Fourier series including input context of said data;

a memory *(20)* comprising a set of initial ordered Fourier series;

an association layer *(14)* operable to add associated Fourier series together to form a string;

an ordering layer *(16)* operable to order said string based on relative degree of association of order formatted subsets of said string with relevant aspects of characteristics with respect to at least one of said initial ordered Fourier series to form an ordered string;

a predominant configuration layer *(18)* for receiving said ordered string and for assigning an activation probability parameter to each of said plurality of Fourier series to produce a predominant configuration string, generating a probability operand based on

said activation probability parameter, said probability operand determining whether an activation of any one of said plurality of Fourier components and said plurality of Fourier series is to cause an activation of an associated another one of said plurality of Fourier components or Fourier series; and

a memory *(20)* adapted to store said predominant configuration string, said predominant configuration string allowing a determination of a relative association of a newly inputted information to said inputted information already processed, thereby recognition of a pattern in said information can be recognized.

An example of claim 285 is disclosed at page 1, line 32 to page 2, line 14 and page 21, line 9 to page 23, line 36. The italicized reference numbers refer to Fig. 5. Claim 285 provides a method of recognizing a pattern in information comprising data, the method comprising:

providing an input layer operable to receive data;

providing an association layer operable to add associated portions of said data together to form a string;

providing an ordering layer operable to order said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered string;

(predominant configuration layer 18 receives ordered strings from the high level memory section 54 and forms more complex ordered strings)

providing a predominant configuration layer operable to receive a plurality of ordered strings to form a complex ordered string therefrom;

assigning an activation probability parameter to each of said input layer, said association layer, said ordering layer and said predominant configuration layer, said activation probability parameter being determined based on a historical value of said activation probability parameter and an activation rate of respective ones of said input layer, said association layer, said ordering layer and said predominant configuration layer;

(the predominant configuration layer 18 includes an activation probability parameter generator 66)

generating a probability operand based on the activation probability parameter; and

(activation probability operand generator 70)

activating one or more of said input layer, said association layer, said ordering layer, said predominant configuration, said ordering layer, said predominant configuration layer, and said association layer if said probability operand has a desired value, whereby a pattern in said information is recognized according to a historical associative pattern in said data.

(input layer 12, association layer 14, string ordering layer 16, predominant configuration layer 18, while the desired value is one in the disclosed example, any suitable value can be selected by the user)

An example of claim 290 is disclosed on page 2, lines 15-33, page 8, line-25, page 13, lines1-26, and page 23, lines 8-26, referring to Fig. 2. Claim 290 provides a computer readable medium having stored thereon a computer program to implement a method of recognizing a pattern in information comprising data, said computer program comprising a plurality of codes for executing the steps of:

encoding said data as parameters of a plurality of Fourier components in Fourier space;

(Fourier transform processor 22, described on page 8, line 20)

adding said plurality of Fourier components together to form a plurality of Fourier series in Fourier space, said plurality of Fourier series representing inputted information;

(page 13, lines 4-6)

sampling at least one of said plurality of Fourier series in Fourier space with a filter to form a sampled Fourier series;

(filter 34, described at page 13, lines 7-10)

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

(filter 34, described at page 13, lines 7-10)

determining a spectral similarity between said modulated Fourier series and another one of said plurality of Fourier series;

(spectral similarity analyzer 36, described at page 13, lines 10-15)

determining a probability expectation value based on said spectral similarity;

(probability expectation analyzer 38, described at page 13, lines 14-17)

generating a probability operand based on said probability expectation value; and

(probability operand generator 40, described at page 13, lines 17-20)

adding said modulated Fourier series and said another Fourier series, if said probability operand has a desired value, to form a string of Fourier series in Fourier space, said string representing an association between Fourier series to thereby allow recognition of a pattern in the information.

(described on page 13, lines 20-26, when the desired probability operand value is a desired value, one in this example, a pattern is recognized and can be outputted as recognized. In the particular disclosed example on page 13, the recognized pattern is outputted in a manner such that the Fourier series is combined with said another Fourier series to a provide string of recognized information represented by the Fourier. The recognized string can be increased in size as desired by repeating the steps of the method.)

An example of claim 294 is disclosed on page 16, line 16 to page 18, line 21, and page 23, lines 8-26. The italicized reference numbers refer to Fig. 4. Claim 294 provides a method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the method comprising:

a.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

(string memory section 44)

b.) selecting at least two filters from a selected set of filters;

(two filters 48 and 50 from a set of filters 52)

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

(high level memory section 54)

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

(spectral similarity analyzer 56)

h.) determining a probability expectation value based on the spectral similarity;

(probability expectation value analyzer 58)

i.) generating a probability operand based on the probability expectation value;

(probability operand generator 60)

j.) repeating steps b-i until the probability operand has a desired value, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

(Processor 42 determines the value of the probability operand. The desired value in the disclosed example on pages 16-18 is one, but can be any value as desired by the user. When the probability operand determined by processor 42 is equal to the desired value a pattern has been recognized.)

k.) storing the summed Fourier series to an intermediate memory;

(intermediate memory section 62)

l.) removing the selected filters from the selected set of filters to form an updated set of filters;

(set of filters 52)

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;

(selecting updated filter 62 from set of filters 52)

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;

(intermediate memory section 62)

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;

(high level memory section 54)

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability operand has a desired value a pattern in information has been recognized an order formatted pattern in the information has been established;

(processor 42)

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

(processor 42)

aa.) storing the Fourier series in the intermediate memory in the high level memory, said updated summed Fourier series representing said plurality of Fourier series in said strings ordered according to a plurality of associations between the information of the plurality of order formatted subset Fourier series and the at least one ordered Fourier series from high level memory.

(high level memory section 54)

An example of claim 299 is disclosed on page 1, line 32 to page 2, line 14, and page 21, line 9 to page 23, line 26, referring to Fig. 5. Claim 299 provides a computer

readable medium having stored thereon a computer program to implement a method of recognizing a pattern in information comprising data and establishing an order formatted pattern in the information, said computer program comprising a plurality of codes for executing the steps of:

providing an input layer operable to receive data;

(input layer 12)

providing an association layer operable to add associated portions of said data together to form a string;

(association layer 14)

providing an ordering layer operable to order said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered;

(string ordering layer 16)

providing a predominant configuration layer operable to receive a plurality of ordered strings to form a complex ordered string therefrom;

(predominant configuration layer 18)

assigning an activation probability parameter to each of said input layer, said association layer, said ordering layer and said predominant configuration layer, said activation probability parameter being determined based on a historical value of said activation probability parameter and an activation rate of respective ones of said input layer, said association layer, said ordering layer and said predominant configuration layer;

generating a probability operand based on the activation probability parameter; and

(activation probability parameter generator 66)

activating one or more of said input layer, said association layer, said ordering layer, said predominant configuration, said ordering layer, said predominant configuration layer, and said association layer if said probability operand has a desired

value, whereby a pattern in said information is recognized according to a historical associative pattern in said data.

(input layer 12, association layer 14, string ordering layer 16, predominant configuration layer 18, while the desired value is one in the disclosed example, any suitable value can be selected by the user)

An example of claim 304 is disclosed on page 1, line 29 to page 4, line 30, and page 21, line 9 to page 23, line 26, referring to Fig. 5. Claim 304 provides a computer program product for use in a system for recognizing a pattern in information comprising data, said computer program product comprising:

a computer readable medium having stored thereon program code means, said program code means comprising:

means for receiving data, and to encode said received data as parameters of a plurality of Fourier series in Fourier space, said plurality of Fourier series including input context of said data;

(input layer 12)

means for associating Fourier series together to form a string;

(association layer 14)

means for ordering said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered string; and

(string ordering layer 16)

means for forming a complex ordered string from a plurality of ordered strings, said complex ordered string representing a historical association and order of processed and stored information to thereby allow recognition of a pattern in information.

(predominant configuration layer 18)

An example of claim 307 is disclosed on page 6, line 25 to page 23, line 26. Claim 307 provides a data structure in a memory for access by a computer program for processing information, said data structure allowing an efficient recognition of a pattern in newly presented information comprising data and input context representing characteristic in relational association with information stored in said memory, said data structure comprising:

a plurality of transduced data objects, each of said plurality of transduced data objects providing an input data object representative of characteristics received from a transducer acting on a signal provided by the characteristics encoded as a Fourier series in Fourier space;

(input layer 12)

a plurality of memory data objects stored in memory registers corresponding to the input data objects;

(register 26 of memory 20)

a plurality of association data objects, each of said plurality of association data objects being a sum of associated ones of said plurality of memory data objects or transduced data objects;

(association layer 14)

a plurality of order formatted data objects, each of said plurality of order formatted data objects being one of said plurality of association data objects arranged in a hierarchically order of relative degree of association of relevant aspects of said information with respect to a standard plurality of association data objects;

(string ordering layer 16)

a plurality of activation probability objects, each of said plurality of activation probability objects being assigned to respective one of said plurality of transduced data objects, input data objects, memory data objects, said plurality of association data objects and said plurality of order formatted data objects;

(activation probability generator 66)

a plurality of probability operands being assigned to respective plurality of transduced data objects, input data objects, memory data objects, said plurality of association data objects and said plurality of order formatted data objects, each based on said activation probability objects;

(activation probability operand generator 70)

wherein each of said plurality of transduced data objects, said input data objects, said memory data objects, said plurality of association data objects and said plurality of order formatted data objects is activated when one of said plurality of probability operands has a desired value; and

(predominant configuration layer 18 discussed on page 22, lines 8-33)

wherein a value of each of said plurality of activation probability objects being determined based on historical values and frequency of activation of said respective one of said plurality of transduced data objects, input data objects, memory data objects, said plurality of association data objects and said plurality of order formatted data objects to thereby allow recognition of characteristics of said newly presented information based on historical relational and associational pattern in said information stored in said memory.

An example of claim 313 is described on page 2, lines 15-33, page 8, line 19 to page 16, line 15, and page 22, line 34 to page 23, lines 26. Claim 313 provides a data structure in a memory for access by a computer program for efficient recognition of a pattern in information comprising data stored in the memory, the data structure comprising:

a plurality of transduced data objects, each of said plurality of transduced data objects providing an input data object representative of characteristics received from a respective one of a plurality of transducers acting on a signal provided by characteristics encoded as a Fourier series in Fourier space, wherein said input data objects allows associations among and relational pattern of said input data objects by spectral analysis to achieve recognition of a pattern in information, while preserving input context of said input signal including an identity of said respective one of said plurality of transducers.

(input layer 12, Fourier transform processor 22, spectral similarity analyzer 36)

(vi) Grounds of Rejection to be Reviewed on Appeal:

I. Whether claims 307-322 comply with 35 U.S.C. § 101.

II. Whether claims 51-322 comply with 35 U.S.C. § 112, first paragraph.

III. Whether claims 51-322 comply with 35 U.S.C. § 101.

(vii) Argument:

Introduction

As mentioned previously, this is now the third appeal Appellant has had to file in connection with this application. Appellant's second appeal, in which he appeared before the Appeals Board to argue his case, resulted in its May 22, 2005 Decision, which was quite specific in instructing how this case should be handled in view of previous abuses that had been brought to the Board's attention. The present rejections in this case stand in complete disregard of those instructions, and for that and other reasons presented below, those rejections should be withdrawn to allow the present claims to issue.

The Office Action that includes the present rejections, mailed on December 21, 2006, was issued over a year and a half (almost 19 months) after the Appeals Board handed down its Decision ruling that "[t]his application, by virtue of its 'special' status, requires immediate action by the examiner. See MPEP § 708.01(d)." [See page 12 of May 22, 2005 Decision. (emphasis in original).] A 19-month delay in rejecting claims can hardly be characterized as "immediate action." Nor did the Examiner comply with the Board's explicit instruction that it "must be informed promptly of an action affecting the appeal in this case, including reopening of prosecution, allowance and/or abandonment of the application." [Id. (emphasis in original).]

Given the sordid prosecution history in this case, it is hardly surprising that the Examiner failed to follow the procedural requirements imposed by the Appeals Board regarding the issuance of further rejections in this case and, as explained further below,

that he also ignored the Board's dictates regarding the substance of those rejections. All of the pending claims were already found to be allowable following review by six different Examiners. Then began a sequence of events leading to the suspicious transfer of this case, not once, but twice, to Examiners who were admittedly unfamiliar with the claimed technology, but who nonetheless entered specious rejections of the claims.

The present application was initially examined by Examiner Kanji Patel and Primary Examiner Christopher S. Kelly, who issued an Office Action on September 3, 1999, rejecting all claims solely under 35 U.S.C. § 101. No prior art rejections were placed on the record. To resolve the Section 101 rejection, the undersigned and Appellant attended a first personal interview with Primary Examiner Bella and Examiner Patel held on November 23, 1999. During that interview, Examiner Bella demonstrated his clear understanding of the invention, including its inherent utility and the adequacy of the disclosure. Indeed, Examiner Bella showed himself quite capable of intelligently discussing in detail the structure associated with the mathematics and flow chart underlying an embodiment of the invention and easily relating that structure to the claims, on a claim-by-claim basis. In view of these discussions, Examiner Bella agreed that the claims represented patentable subject matter and would be allowed if minor formal amendments were made to include the purpose of pattern recognition, as indicated in the Examiner's Interview Summary of November 23, 1999. The Interview Summary also documents the fact that Examiner Bella stated that he would personally attend the Section 101 panel of three Supervisory Patent Examiners who conduct their own examination of claims containing algorithms for compliance with 35 U.S.C. § 101.

The Section 101 panel reviewed the claims and confirmed their allowability. In a subsequent telephone conversation with the undersigned, Examiner Bella reaffirmed his original determination that the claims would be in condition for allowance if minor formal amendments were made to the claims, including amending the preambles of claims 1, 27, and 33 to clarify a useful purpose. These amendments were submitted in the Amendment dated January 27, 2000 with the expectation that all claims would be

allowed. Instead, as explained in detail below, Appellant was met with a series of questionable actions that can only be described as hostile.

As Appellant noted in his previous appeal to the Board, this is not the first time Appellant has been mistreated in this fashion in the prosecution of his patent applications, making it clear that he has been unfairly targeted for abuse. Only three weeks later, Appellant was confronted by other unfortunate events outside the procedural history of the present application that drastically changed the status of this case and resulted in the first appeal. On February 17, 2000, Director Esther Kepplinger of Art Group 1700 improperly withdrew Appellant's unrelated application, U.S. Serial No. 09/009,294, from issuance that was due to issue as U.S. Patent No. 6,030,601 on February 29, 2000. Appellant has good reason to believe that she took that unprecedented action—without even the slightest review of the application—in response to competitive forces outside the PTO aligned against Appellant. [See Director Kepplinger letter dated February 28, 2000 (Exhibit 2 in the first Appeal Brief dated April 3, 2001).] Director Kepplinger also improperly withdrew from issuance four other allowed patent applications of Appellant that were due to issue as patents.[2] The

[2] Director Kepplinger's unfounded attack on Appellant in withdrawing his allowed patent applications from issue was the subject of litigation before the U.S. Court of Appeals for the Federal Circuit (Appeal No. 00-1530). Although the Federal Circuit, in its June 28, 2002 Decision, ultimately upheld the PTO's withdrawal action, it did so based on a finding that there was an "emergency situation" that trumped the controlling regulation requiring the PTO to determine the unpatentability of one or more claims before it withdrew the '294 application from issue. [*See BlackLight Power, Inc. v. Director James E. Rogan*, 63 USPQ2d1534 (Fed. Cir. 2002).] Appellant believes that the Federal Court's opinion was erroneously decided due, in part, to the Court's misreading of a concurring opinion of one Justice in a 38-year-old Supreme Court case to support its holding that this supposed "emergency situation"—a finding that was not supported by the record or even argued by the PTO—justified the PTO's withdrawing BlackLight's copending '294 application from issue on February 17, 2000, after payment of the issue fee. *See BlackLight Power* at page 7 *citing Baltimore & Ohio Railroad Co. v. United States*, 386 U.S. 372, 421 (1964) (Brennan, J., concurring) (recognizing the importance of leaving the Interstate Commerce Commission (ICC) great flexibility to deal with emergency situations to avoid serious damage to the national transportation system, but finding no pressing need that justified the ICC's action). The Federal Circuit stretched

subject matter of those withdrawn patent applications relates to the field of quantum mechanics and, thus, bears no relation to the underlying artificial intelligence technology disclosed in the present application on appeal.

In view of this prior history, it can hardly be viewed as coincidence that, after Examiner Bella indicated allowable subject matter in this case, it was transferred without warning or explanation to a seventh Examiner, Bijon Tadayon, for rejection during the very same week of February 17, 2000 that Appellant's unrelated allowed applications were withdrawn from issuance. Clearly, the timing of these events demonstrates that the transfer and rejection of this case was merely an extension of the PTO's initial harassment of Appellant in attacking his other applications and raises suspicions that motives other than a fair and complete prosecution of this case may have played a factor. Adding to this suspicion is the fact that Examiner Tadayon, in rejecting the present claims, cited references relating to quantum mechanics—the subject of Appellant's prior withdrawn applications—even though the claimed artificial intelligence invention bears no relationship whatsoever to quantum mechanics.

Further suspicions were raised by Examiner Tadayon's statements to the undersigned and Appellant during a second interview held on June 1, 2000, following the transfer of the case. During that interview, the Examiner alleged that he took control over the present application based on his supposed expertise in the field of artificial

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that case way beyond the limits of Supreme Court precedent that requires government agencies to strictly follow statutory and regulatory guidelines.

Incredibly, at oral argument, the PTO did not even suggest that an emergency situation had forced it to withdraw this application from issue on February 17, 2000. To the contrary, PTO Solicitor John M. Whealan argued that <u>no</u> withdrawal—emergency or otherwise—occurred on that date and admitted that, if the Court found otherwise, his case would be seriously compromised. This was because, at that time, the PTO could not locate the patent file and admittedly could not have made a determination of unpatentability of one or more claims as required by the controlling regulation. *See* 37 C.F.R. § 1.131(b)(3); MPEP § 1308 (7th Ed., Rev. 1, Feb. 2000). Despite the PTO's recognition that a withdrawal action would have required such a determination, that admission was not enough to sway the Court's ruling.

intelligence. From the discussions held during the interview, however, it became increasingly clear that Examiner Tadayon lacked even a basic understanding of Appellant's novel usage of Fourier series in Fourier space to achieve advances in artificial intelligence technology.

Incredibly, Examiner Tadayon flatly refused to even discuss the present claims or the Section 101 and 102 rejections during the interview, and would only discuss a limited aspect of the Section 112 rejection, as reflected in the Interview Summary. Examiner Tadayon gave the following reasons for his steadfast refusals: (1) he was not the Examiner who made the Section 101 and 102 rejections; (2) he was not an expert on Section 101 rejections; and (3) he would need to confer with other Examiners in response to any questions regarding the claims and the Section 101 rejection.

Appellant respectfully submits that by wresting control of the present application away from Examiner Bella, who with clear understanding of the claimed invention indicated its allowability—as did the Section 101 panel of three senior Examiners—and giving it Examiner Tadayon, who rejected the claims despite his lacking such understanding, lends credence to Appellant's charges of abusive treatment by the PTO in this case.

Since Examiner Tadayon was not the PTO official responsible for formulating the prior rejections in this case, as apparent from his comments, Appellant renews his previous request for a full disclosure on the record of all PTO officials and persons from outside the PTO, if any, who provided input on the March 14, 2000 Office Action, the pending December 18, 2006, Office Action, or the present application in general. Appellant does not make this request lightly. As previously indicated, a Secret Committee of Examiners and Directors have been convened to conduct a "behind-the-scenes" prosecution of Appellant's other withdrawn applications. [See Director Kepplinger letter dated January 19, 2001 (Exhibit 3 in the first Appeal Brief dated April 3, 2001).] Appellant has good reason to believe that his competitors may have been involved in the withdrawal and subsequent prosecution of those applications.

That good faith belief is based, in part, on disturbing information that came to light regarding the activities of Appellant's competitors, who are associated with the American Physical Society (APS). Specifically, Appellant has learned from Dr. Peter Zimmerman (former chief science advisor at the U.S. Department of State and member of the APS) that there is a "Deep Throat" contact in the PTO with whom Dr. Robert Park (spokesperson for the APS) has had communications regarding Appellant's pending patent applications. The PTO was made aware of this outrageous situation years ago in connection with the above-mentioned litigation and, to this day, has not refuted it. [See the Kepplinger letter dated January 19, 2001 (Exhibit 3 in first Appeal Brief dated April 3, 2001).]

Evidence linking Dr. Park and the APS to the shenanigans pulled in the present application is even more disturbing. Appellant has learned through Mr. Ivan Solotaroff, a reporter for *The New York Times* and *Philadelphia Magazine*, that Dr. Park has attacked the present application. Specifically, Mr. Solotaroff conveyed to Appellant Dr. Park's statement to him that "Randy [Mills, Appellant] doesn't get it, the money is in the Quantum Computer based on entanglement and simultaneous computation in multiple parallel dimensions [greater than four]." Mr. Solotaroff also relayed how Dr. Park boasted about blocking the present artificial intelligence patent application from being allowed because it may interfere with the Quantum Computer project endorsed by the APS and funded by the Department of Defense to the sum of over a hundred million dollars.

Appellant respectfully submits that the questionable timing of the transfer of the pending application to Examiner Tadayon, his refusal to discuss in an interview the pending claims and the Section 101 and 102 rejections of the claims, and his admission that other unnamed officials were responsible for actually preparing the Section 101 and 102 rejections are entirely consistent with the report of Dr. Park's boasting about blocking allowance of the pending application. Moreover, the limited extent to which Examiner Tadayon was willing to discuss the Section 112 rejection during the interview and his strained arguments relating thereto lend further credence to the notion that the

PTO was purposely using irregularities in the patent examination process to harass Appellant. As detailed in the lengthy four-page Interview Summary, the Examiner was intent on manufacturing non-existent holes in the logic of Appellant's invention using strained arguments that bordered on nonsensical.

For example, Examiner Tadayon was extremely combative during the personal interview, particularly in his improper focus and misinterpretation of a mathematical formula described in the present specification instead of on the claimed invention. Unfortunately, in doing so, he failed to grasp mathematical concepts that should have been readily apparent. When the topic of discussion turned to the claimed invention and Examiner Tadayon was questioned why the detailed, yet simple-to-follow, flow charts provided in Figs. 1-21E did not comply with the requirements of Sections 101 and 112, inexplicably, he could not articulate any response.

Yet another example of Examiner Tadayon's strained arguments was his assertion during the interview that Appellant had derived a new Fourier transform operation and his insistence that Appellant provide a mathematical proof thereof. The Examiner apparently failed to recognize that Fourier-type transforms are well known and that Appellant is simply using a novel method to parameterize data to form a novel type of Fourier series and, in a broader embodiment, Fourier series are not even required, only a parameterization of a corresponding formula. Ironically, Appellant has already gone well beyond what the patent laws and rules require by providing detailed derivations of the mathematical formulae and examples in the Sub-Appendices to the application.

Ignoring the disclosed derivations, Examiner Tadayon requested additional proof of orthoganality for Fourier series based upon his mistaken belief that a data set input to Appellant's system must have the property of orthogonality to be parameterized into a Fourier series as taught by Appellant. This argument is complete nonsense. Real world data is not necessarily orthogonal, nor does Appellant's invention require the data sets to be orthogonal. Had Examiner Tadayon made even a cursory review of the application—which apparently he did not—he would have realized that Appellant's

disclosed invention does not teach Fourier transforming the input data as a waveform into a Fourier series with the requirement of orthogonal components. [See Siebert, W., Circuits, Signals, and Systems, The MIT Press, Cambridge, Massachusetts, (1986), pp. 364-384, cited on page 106 of the present application (Exhibit 4 of April 3, 2001 Appeal).] In one embodiment, Appellant teaches FORMATTING the data as parameters ρ_{0_m} and $N_{m_{\rho 0}}$ of each component of a Fourier series in Fourier space. This format permits the determination of the spectral similarity of one set of data so formatted and another formatted in the same manner. In another embodiment, the data is simply formatted in terms of a specific memory structure that determines the parameterization of a formula for determination of the spectral similarity of one set of data and another. [See page 13, line 1 to page 16, line 15 and page 45, lines 3-8 of the present application.]

To his credit, Examiner Tadayon did offer a candid explanation during the interview for his lack of familiarity with the subject matter of the claimed invention, stating that he was so busy teaching new Examiners that he did not have time to learn the invention. Of course, if Examiner Tadayon was too busy to properly study the application and give it proper consideration, that raises the question of why he was instructed to take over examination of this case in the first place.

Appellant has spent over nine years prosecuting this application at considerable expense. It is simply outrageous that the PTO would subvert allowance of this case by ignoring the thorough examination conducted by three previous Examiners and the Section 101 panel of senior Examiners specializing in reviewing claims containing algorithms, and by transferring the case under suspicious circumstances to an Examiner who admittedly is not an expert in the field of artificial intelligence and was unable to articulate the bases for his rejections.

Even after Appellant brought all of the above-mentioned abuses to the PTO's attention in his Appeal Brief filed on April 3, 2001, the PTO still refused to address Appellant's concerns. Instead, it continued to harass Appellant by transferring the

application to yet an <u>eighth</u> Examiner, Wenpeng Chen (the present Examiner), for what would be the <u>fourth</u> examination of the present application.

Examiner Chen, in a feeble attempt to explain away Examiner Tadayon's hostile prosecution of this case, offered only the following excuse for his behavior:

> As explained in Specification section below, the specification can cause confusion. Because of the confusion, Claims 51-322 were rejected under 35 U.S.C. § 112, first paragraph in the previous Office Action by Examiner Tadayon under his reasonable interpretation. Examiner Tadayon has left USPTO. Continuous execution of this case was assigned to the present Examiner Wenpeng Chen. [Prior Office Action dated July 19, 2001 (subject of second appeal) at page 2]

This statement only begs the question: What was the PTO's true motivation in initially transferring the application away from Examiner Bella—who had thoroughly examined the claims, conducted an extensive personal interview to discuss the application and fully understood the specification, and had the case reviewed by the panel of three senior Examiners—to Examiner Tadayon, who admittedly did not understand the invention?

The PTO thus failed to explain why this application was not returned to Examiner Bella, who understands the disclosed invention and is qualified to examine it. Rather, the PTO responded simply by transferring this application yet again, this time to Examiner Chen, who, as explained below, also admittedly does not understand the claimed invention. Appellant has already gone to considerable expense to appeal this case, the first time to defeat the nonsensical rejections applied by Examiner Tadayon, after having received an indication of allowability by six previous Examiners. Examiner Chen merely withdrew Examiner Tadayon's rejections and substituted his own, even more extreme rejections, which resulted in a second, and now third, appeal at further undue expense to Appellant.

One of the few comments by Examiner Chen—whether intentional or not—that Appellant can agree with is his reference in the above-cited quote to the "[c]ontinuous <u>execution</u> of this case," which is an honest assessment of what has transpired in this case. The PTO, in effect, has sought the "execution" of Dr. Randell L. Mills' patent

applications, including the present application, using unconventional procedures to carry out the "death sentence" by any means necessary. Examiner Chen is merely acting as yet another "executioner" willing to make ever more strained operability and enablement rejections in an attempt to kill off Appellant's applications at all costs.

Appellant notes that Examiner Chen had previously stated that "[c]laims 96-97, 206-207, and 277 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims." [See paragraph 31 on page 31 of the Office Action mailed July 19, 2001.] In the present Office Action, Examiner Chen now rejects all of the claims 51-313 under 35 U.S.C. §§ 101 and 112, first paragraph, based on a continued fundamental misunderstanding of the invention in conflict with this Board's specific instructions regarding how this case should be handled.

The Examiner starts out on page 2 of the pending Office Action, by misstating what the Board had ordered him to do:

> On 3/33/2005 [sic], the Board of Patent Appeals and Interference (BPAI) remanded the appeal case back to the Examiner (1) for the Appellant to enter definitions of "Fourier Series in Fourier Space" and "Probability Operand" in the specification and (2) for the Examiner to make further consideration after the entry. In the Remand, BPAI considered that adding the definitions would not introduce new matter. The Examiner acknowledged this BPAI's decision. A new Office action is given below.

This statement is woefully incomplete. While the Examiner correctly notes that the Appeals Board found that the definitions do not add new matter, he leaves out other important aspects of the Appeals Board's March 22, 2005 Decision, including its explicit instructions to act <u>immediately</u> in this case and inform the Board of what action was being taken. The Examiner further omits, not surprisingly, the fact that the Board overturned all of his prior art rejections that were pending at that time and cautioned him against rejecting claims 307-322 under 35 U.S.C. § 101 on the previously stated grounds. The Board specifically warned the Examiner that, should he repeat that rejection, he must point out how he considers independent claims 307 and 313 to be data structures, <u>per se</u>, in view of the limitations: "A data structure in a memory . . . with

information stored in said memory . . . a plurality of memory data objects . . . to thereby allow recognition of characteristics of said newly presented information . . . in said information stored in said memory" of claim 307, and "A data structure in memory . . . comprising data stored in the memory . . . to achieve recognition of a patter in information" as recited in claim 313. [See May 22, 2005 Decision at pp. 11-12.] Thus, in rejecting the claims in the present Office Action, the Examiner not only failed to comply with the Board's procedural requirements to act immediately and to bring to its attention the nature of that action, but he also ignored the substantive requirements for those rejections as dictated by the Board.

As discussed below, such unfair treatment of Appellant in prosecuting his patent application constitutes an intolerable abuse of the examination process and undermines the pending rejections in this case, which, therefore, should be withdrawn posthaste to allow this case to issue.

I. Claims 307-322 Comply With 35 U.S.C. § 101

The rejection of claims 307-322 under 35 U.S.C. § 101 as being directed to non-statutory subject matter is respectfully traversed. The claimed invention fully complies with Section 101 for the following reasons.

The Examiner argues on pages 2-3 of the Office Action that:

> The claimed invention is a computer related invention. The Computer-Implemented Invention Guidelines issued by the U.S. Patent and Trademark Office describe the procedures for examining such inventions. A flow chart of the procedures was attached at the end of paper #17.
>
> For Claims 307-322, we examined them according to box 6 in the flow chart. The step in box 6 is to determine whether the invention as defined by the claims falls within one of the three following categories of unpatentable subject matter: (I) Functional descriptive material such as a data structure per se or a computer program per se, (2) Non-functional descriptive material such as music, literary works or pure data, embodied on a computer readable medium; or (3) A natural phenomenon such as energy or magnetism. The invention as defined by Claims 307-322 is a

> data structure stored in a memory. However, the data are not functional and therefore are non-statutory as explained below.
>
> With regard to Claim 313
>
> Although Claim 313 recites a data structure in a memory, the recited features in the claim body do not constitute a functional description material. Claim 313 recites a plurality of transduced data objects. The data objects are just a compilation of various measured data. As shown in Fig. 3 and pages 8-1 1, the plurality of transduced data objects can be just output from pixels of a CCD camera. In page 9, lines 8-9, the Appellant explicitly stated that "since the structure of a Fourier series is known in the art, only the parameters need to be stored in a digital embodiment." For a CCD camera, the camera (a transducer) transduces an incoming light into electrical signals by each pixel of the CCD. The location of the pixel in the CCD camera and the electrical signals associated with each pixel are the parameters. The clause in lines 8-11 starting with the word "wherein" in [sic] just an intended use and does not provide any functional limitation to the transduced data objects. Any picture data taken by a camera and stored in a memory meet the recited requirement, because they can be used for various image processing including the intended use of association with spectral analysis. The picture data stored in a memory are just data per se such as music or text document. They are just non-functional information provided for a functional machine or processor. The functionality is provided by the machine or processor, not by the compilation of data which is termed data structure here.

Notably, the Examiner fails to discuss how he considers the claims to be data structures, per se, in view of the specific claim limitations cited by the Appeals Board in its May 22, 2005 Decision. On that basis alone, the present rejections should be withdrawn and the case allowed.

The comments above further demonstrate the Examiner's failure to grasp a clear understanding of the claimed invention, which is not merely a data structure as he alleges. Rather, it employs a unique method and system of processing data in order to achieve pattern recognition and processing information contained in the data and encoded in the data structure via formatting according to the invention.

Contrary to his conclusory remarks, the Examiner further errs in failing to appreciate that the data are functional. The transduced data objects are processed to

form a representation of the information contained in the data from a detector in the form of a Fourier series in Fourier space. The data is used as parameters that are input to the system and means to process and achieve pattern recognition and processing.

For example, as disclosed on page 8, lines 19-29, of the present specification, Appellant teaches that:

> Referring to FIGURE 2, in the first step, the Input Layer 12 receives the data from the transducer (not shown). A Fourier transform processor 22 encodes each data element as parameters of a Fourier component in Fourier space and stores the data parameter values to the Input Layer section 24 of the memory 20. Each Fourier component of the Fourier series may comprise a quantized amplitude, frequency, and phase angle. For example the Fourier series in Fourier space may be:
>
> $$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$
>
> having a quantized amplitude, frequency, and phase angle, wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are the data parameters.

Appellant further teaches an example on page 10, lines 12-25, and Figure 3 of the present specification, that a data structure to encode input context:

> The physical context is conserved by mapping with a one to one basis between the physical context and the input context based on the identity of each transducer. The input context is conserved by mapping on a one to one basis to the Input Layer section 24 of memory 20. In an embodiment, the input context is encoded in time as a characteristic modulation frequency band in Fourier space of the Fourier series. The characteristic modulation frequency band in Fourier space represents the input context according to the identity of a specific transducer of the relationship of two transducer elements. The modulation within each frequency band may encode not only input context but context in a general sense. The general context may encode temporal order, cause and effect relationships, size order, intensity order, before-after order, top-bottom order, left-right order, etc. all of which are relative to the transducer.

Raw data from transducers do not have input context encoded; nor, is data stored in a manner to provide the Fourier series in Fourier space taught by Appellant.

Furthermore, the Examiner takes out of context the statement about "known in the art." See page 9, lines 4-9 of the present specification, which states:

> As illustrated in FIGURE 3 and described above, for each CCD element, the Fourier series, parameterized accordingly, are stored to a specific sub register 27 of a specific register 26 of the Input Layer section 24 of the memory 20. Since the structure of a Fourier series is known in the art, only the parameters need to be stored in a digital embodiment.

Once Appellant solved the novel Fourier series in Fourier space, the data formatting and retrieval in order to parameterize the functions to process the data was enabled without storing the final parameterized Fourier series in Fourier space.

In further processing steps, the data structure must be organized according to how the data would exist in the Fourier series in Fourier space of the present invention and is operated on according to this structure. Raw data without formatting and organization and without subsequent processing as taught by Appellant has no utility to achieve pattern recognition or processing. In one exemplary embodiment, Appellant teaches that the processing of signals causes the modification of computer hardware with power consumption, such as the storage of parameters encoding the information. For example, from the Abstract:

> Information representative of physical characteristics or representations of physical characteristics is transformed into a Fourier series in Fourier space within an input context of the physical characteristics that is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies.

And, on page 6, line 25 to page 7, line 10, the specification further teaches:

> The present invention is directed to systems and methods for performing pattern recognition and association based upon receiving, storing, and processing information. The information is based upon physical characteristics or representations of physical characteristics and a relationship of the physical characteristics, hereinafter referred to as physical context, of an item of interest. The physical characteristics and physical context serve as a basis for stimulating a transducer. The transducer converts an input signal representative of the physical characteristics and the physical context into the information for

processing. The information is data and an input context. The data is representative of the physical characteristics or the representations of physical characteristics and the input context corresponds to the physical context based upon the identity of a specific transducer and its particular transducer elements. The physical context maps on a one to one basis to the input context. The information defines a Fourier series in Fourier space that represents the item of interest. In other words, a Fourier series in Fourier space represents the information parameterized according to the data and the input context. In addition, the input context maps on a one to one basis to an Input Layer section of a memory. Thus, there is a one to one map of physical context to input context to Input Layer section of a memory. The representation of information as a Fourier series in Fourier space allows for the mapping.

For these many reasons, Appellant submits that claims 307-322 fully comply with Section 112.

II. Claims 51-322 Comply With 35 U.S.C. § 112, First Paragraph

The rejection of claims 51-322 under 35 U.S.C. § 112, first paragraph, on page 4 of the present Office Action is respectfully traversed. The claimed invention fully complies with Section 112, first paragraph, for the following reasons.

The Examiner states on page 4 of the Office Action, without basis, that:

> a. The whole specification describes only an explicit embodiment. The explicit embodiment is supported by the equations shown in the specification. The specification also includes various alternative embodiments to the explicit one. However, because of the untraditional definitions of the steps the alternative embodiments do not provide adequate descriptions to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use all the alternative non-explicit embodiments. For example, the passage in lines 18-25 of page 11 states that "the characteristic modulation is encoded as a delay in time by storing the Fourier series in a specific portion of the Input layer section of the memory wherein the specific portion has n+1 sub time intervals." Not adequate description is given in this paragraph what specific function is used how the encoding is performed [sic].

Appellant provides a clear and detailed enabling disclosure, and further provides a specific working example. The data structure, processing layers, and steps of the method and system for pattern recognition and processing are clearly enabling.

Support for claims 51-322 is given on page 1, line 1 to page 24, line 8 of the present specification. Appellant has provided background material related to signal processing theory, theory of coupled as well as cascaded systems, statistics, statistical thermodynamics with regard to the behavior of a large number of interconnected units of a system, and experimental measurement and signal-processing analysis of action potentials. These materials are identified on page 23, line 27 to page 24, line 7 of the present specification:

> Also, included as part of this application is a Support Appendix and associated sub-appendices. These include the following:
>
> SUB-APPENDIX I is the derivation of the Input and the Band-Pass Filter of the Analog Fourier Processor according to the present invention;
>
> SUB-APPENDIX II is the derivation of the Modulation and Sampling Gives the Input to the Association Mechanism and Basis of Reasoning according to the present invention;
>
> SUB-APPENDIX III is the derivation of the Association Mechanism and Basis of Reasoning according to the present invention;
>
> SUB-APPENDIX IV is the Ordering of Associations: Matrix Method according to the present invention;
>
> SUB-APPENDIX V is the GENOMIC DNA SEQUENCING METHOD/MATRIX METHOD OF ANALYSIS according to the present invention;
> SUB-APPENDIX VI is the derivation of the Input Context according to the present invention, and
>
> SUB-APPENDIX VII is the derivation of the Comparison of Processing Activity to Statistical Thermodynamics/Predominant Configuration according to the present invention.

The disclosure taken in its entirety is enabling to one skilled in the art.

On page 1, line 32 to page 2, line 14, the specification teaches:

The system of the present invention includes an Input Layer for receiving data representative of physical characteristics or representations of physical characteristics capable of transforming the data into a Fourier series in Fourier space. The data is received within an input context representative of the physical characteristics that is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies. The system includes a memory that maintains a set of initial ordered Fourier series. The system also includes an Association Layer that receives a plurality of the Fourier series in Fourier space including at least one ordered Fourier series from the memory and forms a string comprising a sum of the Fourier series and stores the string in memory. The system also includes a String Ordering Layer that receives the string from memory and orders the Fourier series contained in the string to form an ordered string and stores the ordered string in memory. The system also includes a Predominant Configuration Layer that receives multiple ordered strings from the memory, forms complex ordered strings comprising associations between the ordered strings, and stores the complex ordered strings to the memory. The components of the system are active based on probability using weighting factors based on activation rates.

On page 10, line 12 to page 11, line 17, the specification teaches:

The physical context is conserved by mapping with a one to one basis between the physical context and the input context based on the identity of each transducer. The input context is conserved by mapping on a one to one basis to the Input Layer section 24 of memory 20. In an embodiment, the input context is encoded in time as a characteristic modulation frequency band in Fourier space of the Fourier series. The characteristic modulation frequency band in Fourier space represents the input context according to the identity of a specific transducer of the relationship of two transducer elements. The modulation within each frequency band may encode not only input context but context in a general sense. The general context may encode temporal order, cause and effect relationships, size order, intensity order, before-after order, top-bottom order, left-right order, etc. all of which are relative to the transducer.

Still referring to FIGURE 3, the transducer has n levels of subcomponents. Each transducer is assigned a portion 26 of the Input Layer section 24 of the memory 20. The memory 20 is arranged in a hierarchical manner. Specifically, the memory is divided and assigned to

correspond to a master time interval with $n+1$ sub time intervals. The hierarchy parallels the n levels of the transducer subcomponents. The nth level transducer sub component provides a data stream to the system 10. The data stream is recorded as a function of time in the $n+1$ sub time interval. The time intervals represent time delays which correspond to the characteristic modulation frequency band in Fourier space which in turn represents the input context according to the specific transducer or transducer subcomponent.

An exemplary complex transducer which may be represented by a data structure comprising a hierarchical set of time delay intervals is a CCD array of a video camera comprising a multitude of charge coupled devices (CCDs). Each CCD comprises a transducer element and is responsive to light intensity of a given wavelength band at a given spatial location in a grid. Another example of a transducer is an audio recorder comprising transducer elements each responsive to sound intensity of a given frequency band at a given spatial location or orientation. A signal within the band 300-400 MHz may encode and identify the signal as a video signal; whereas, a signal within the band 500-600 MHz may encode and identify the signal as an audio signal. Furthermore, a video signal within the band 315-325 MHz may encode and identify the signal as a video signal as a function of time of CCD element (100,13) of a 512 by 512 array of CCDs.

Thus, it is apparent to one skilled in the art that the encoding can be provided by a specific modulation frequency tag of the Fourier series, which corresponds to a specific time delay that is recorded in the appropriately designated section of memory having "n+1 sub time intervals".

On pages 4-5 of the Office Action, the Examiner incorrectly asserts that:

> b. The explicit embodiment of the application is disclosed in Figs. 1-2 and all the equations. It comprises an input layer, an association layer, a string ordering layer, a predominant configuration layer, and a memory. All Claims 51-322 are supported by these five elements. When one cannot implement any of the above elements, one cannot implement any of Claims 51-322.

The Examiner has it completely wrong. While the layers may function independently of each other, the preferred embodiment comprises their use in concert. For example, it is possible to perform associations in the Association Layer without its

activation controlled by the Predominant Configuration Layer, and Strings can be ordered independently in the String Ordering Layer independent of both.

The Examiner further states on page 5 of the Office Action:

> The Examiner spent many hours trying to figure out how to implement all of the five elements. Unfortunately, the Examiner cannot follow the specification to do so. The Examiner thus concludes that the specification cannot enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention defined by Claims 51-322. Detailed questions are given below. As long as the Appellant can answer the Examiner's questions and demonstrate the enabling of each questioned step, the Examiner will withdraw the rejection.

It is unfortunate that the Examiner is unable to comprehend the invention, which is clearly disclosed such that one skilled in the art could readily practice it. In fact, an embodiment of Appellant's invention has been through exhaustive peer review and is published in the artificial intelligence literature, a higher standard than required by the U.S. Patent and Trademark Office. Thus, the PhD referees and the Journal have agreed that Appellant's invention teaches a novel, operative development in this field. See R. L. Mills, "Novel Method and System for Pattern Recognition and Processing Using Data Encoded as Fourier Series in Fourier Space", Engineering Applications of Artificial Intelligence, Vol. 19, (2006), pp. 219-234.

In addition, Appellant has received inquiries to present this breakthrough at conferences and to submit additional articles, again confirming the operability of the claimed invention to one skilled in the art.

Appellant notes that Examiner Chen previously stated that "[c]laims 96-97, 206-207, and 277 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims." [See paragraph 31 on page 31 of the Office Action mailed 19 July 2001.] In view of that statement, for the Examiner to now attempt to argue, at this late stage—particularly in view of the sordid history of this case—that the present disclosure in non-enabling does not pass muster. Despite the obvious inconsistencies and other defective positions now taken by the Examiner, Appellant

addresses and answers each of the Examiner's "questions," demonstrating that his claimed invention is fully enabled.

On page 5 of the Office Action, the Examiner states:

> In the amendment allowed by the Board to be entered, the Appellant explicitly defined "Fourier series in Fourier space" as follows.
>
> "Fourier series in Fourier space is a sum of trigonometric functions in frequency space where each variable is frequency and the parameters of the Fourier series are input data or processed input data."
>
> According to Eq. (37.32), a Fourier Component (FC) is defined as a function in k space, such as $V(k_p, k_z)$ that is a function of (k_p, k_z). The function is defined with a set of parameters of an element. In Eq. (37.32), the parameters and the explicit forms of trigonometric functions on the right hand side disappear after summation to create $V(k_p, k_z)$ on the left hand side. Accordingly, $V(k_p, k_z)$ is indexed with the element's index m, but not explicitly carry any information of the parameters.
>
> According to Eq. (37.33), a Fourier series is a "SFCs" (series of Fourier Components) is also defined as a function in k space, such as $V_{\Sigma m}(k_p, k_z)$, that is also a function of (k_p, k_z). After summation of FCs to form $V_{\Sigma m}(k_p, k_z)$, it does not explicitly carry even the index information of each element m. As a consequence, no mathematical operation can be applied to each individual FC after a Fourier series (FS) is formed. For example, modulation or sampling to a FS can only be specified by (k_p, k_z), but not m. According to Eq. (37.107), a sum of FSs of various transducers can be formed and is also defined as a function in k space, such as $V_{\Sigma s,m}(k_p, k_z)$, that is also a function of (k_p, k_z). After summation of FSs to form $V_{\Sigma s,m}(k_p, k_z)$, $V_{\Sigma s,m}(k_p, k_z)$, does not explicitly carry the index information of each FS, s, nor element m. As a consequence, no mathematical operation can be applied to each individual FC or each individual FS after a string is formed. For example, modulation or sampling to a string can only be specified by (k_p, k_z), but not s or m.

Support for claims 51-322 can be found on page 1, line 1 to page 24, line 8 of the present specification. Appellant's definition of a Fourier Series in Fourier space fully applies to this disclosure. See the below the comparison of a Standard Fourier Series to Appellant's Fourier Series in Fourier space.

In addition, although not required, Appellant has provided background material related to signal processing theory, theory of coupled as well as cascades systems, statistics, statistical thermodynamics with regard to the behavior of a large number of interconnected units of a system, and experimental measurement and signal-processing analysis of action potentials in the originally field application. These materials are identified on page 23, line 27 to page 24, line 7 of the specification:

> Also, included as part of this application is a Support Appendix and associated sub-appendices. These include the following:
>
> SUB-APPENDIX I is the derivation of the Input and the Band-Pass Filter of the Analog Fourier Processor according to the present invention;
>
> SUB-APPENDIX II is the derivation of the Modulation and Sampling Gives the Input to the Association Mechanism and Basis of Reasoning according to the present invention;
>
> SUB-APPENDIX III is the derivation of the Association Mechanism and Basis of Reasoning according to the present invention;
>
> SUB-APPENDIX IV is the Ordering of Associations: Matrix Method according to the present invention;
>
> SUB-APPENDIX V is the GENOMIC DNA SEQUENCING METHOD/MATRIX METHOD OF ANALYSIS according to the present invention;
>
> SUB-APPENDIX VI is the derivation of the Input Context according to the present invention, and
>
> SUB-APPENDIX VII is the derivation of the Comparison of Processing Activity to Statistical Thermodynamics/Predominant Configuration according to the present invention.

The material developed in SUB-APPENDIX I entitled, "The Input and the Band-Pass Filter of the Analog Fourier Processor", which contains Eq. (37.32), is background material wherein a discrete series of pulses of finite length is Fourier transformed according to conventional methods. The same applies to Eq. (37.107). Thus, these results are different from the definition of a novel Fourier series in Fourier space of the

present invention, as disclosed in the specification on page 1, line 1 to page 24, line 8 and set forth in Claims 51-322. In one embodiment, the RHS of Eq. (37.32) and Eq. (37.107) provides the form of the data structure that is processed, wherein the variables are substituted with the data parameters as specified in the specification. For example, on page 8, line 19 to page 9, line 9, the specification teaches:

> Referring to FIGURE 2, in the first step, the Input Layer 12 receives the data from the transducer (not shown). A Fourier transform processor 22 encodes each data element as parameters of a Fourier component in Fourier space and stores the data parameter values to the Input Layer section 24 of the memory 20. Each Fourier component of the Fourier series may comprise a quantized amplitude, frequency, and phase angle. For example the Fourier series in Fourier space may be:
>
> $$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$
>
> having a quantized amplitude, frequency, and phase angle, wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are the data parameters.
>
> In a first embodiment, the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component are proportional to the rate of change of the physical characteristic. Each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic. In the triangle example, the amplitude of the voltage at a given CCD element relative to the neighboring CCD element defines the rate of change of the voltage which is converted into the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$. The inverse of the amplitude of the voltage of each CCD element is converted into the data parameters ρ_{0_m} and z_{0_m}. As illustrated in FIGURE 3 and described above, for each CCD element, the Fourier series, parameterized accordingly, are stored to a specific sub register 27 of a specific register 26 of the Input Layer section 24 of the memory 20. Since the structure of a Fourier series is known in the art, only the parameters need to be stored in a digital embodiment.

This same argument applies equally to Eq. (37.33).

On page 6 of the Office Action, the Examiner states that:

Question (1)

> In Fig. 21A, a sum of FSs is formed and stored in a register according the second equation in Fig. 2 IA. One ordinary person skill in the art knows how to do it based on this equation. However, one ordinary person skill in the art does not know how to recall Fourier series based the third equation of Fig. 2IA. As explained above, after the sum of FSs is formed according the second equation of Fig. 2IA, the only information remained is the left hand side of the second equation $V_{\Sigma s,m}(k_p, k_z)$. It is only an equation of (k_p, k_z). All the information on the right hand side of the second equation are not preserved after summation, without each information of the infinite terms on the right hand side of the second equation in Fig. 21A, how can one perform the right hand side of the third second equation in Fig. 2IA to recall a Fourier series?

One again, the Examiner misapprehends Applicant's invention. Applicant's definition of a Fourier Series in Fourier space applies to the disclosure given on page 1, line 1 to page 24, line 8. Although not required, additional background material has also been provided by Applicant relating to signal processing theory, theory of coupled as well as cascades systems, statistics, statistical thermodynamics with regard to the behavior of a large number of interconnected units of a system, and experimental measurement and signal-processing analysis of action potentials. These materials are identified on page 23, line 27 to page 24, line 7 of the specification. The material developed in SUB-APPENDIX I entitled, "The Input and the Band-Pass Filter of the Analog Fourier Processor", that contains Eq. (37.27), which is equivalent to the equation referenced by the Examiner in Figure 21A, as well as Eq. (37.32), is background material, wherein a discrete series of pulses of finite length is Fourier transformed according to conventional methods. The same applies to Eq. (37.107). Thus, these results are different from the definition of a novel Fourier series in Fourier space of the present Invention as disclosed in the specification on page 1 line 1 to page 24, line 8 and claimed in claims 51-322. In one embodiment, the RHS of Eq. (37.32) and Eq. (37.107) provides the form of the data structure that is processed wherein the variables are substituted with the data parameters as specified in the cisclosure. For example, on page 8, line 19 to page 9, line 9 of the specification, Applicant teaches:

Referring to FIGURE 2, in the first step, the Input Layer 12 receives the data from the transducer (not shown). A Fourier transform processor 22 encodes each data element as parameters of a Fourier component in Fourier space and stores the data parameter values to the Input Layer section 24 of the memory 20. Each Fourier component of the Fourier series may comprise a quantized amplitude, frequency, and phase angle. For example the Fourier series in Fourier space may be:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

having a quantized amplitude, frequency, and phase angle, wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are the data parameters.

In a first embodiment, the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component are proportional to the rate of change of the physical characteristic. Each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic. In the triangle example, the amplitude of the voltage at a given CCD element relative to the neighboring CCD element defines the rate of change of the voltage which is converted into the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$. The inverse of the amplitude of the voltage of each CCD element is converted into the data parameters ρ_{0_m} and z_{0_m}. As illustrated in FIGURE 3 and described above, for each CCD element, the Fourier series, parameterized accordingly, are stored to a specific sub register 27 of a specific register 26 of the Input Layer section 24 of the memory 20. Since the structure of a Fourier series is known in the art, only the parameters need to be stored in a digital embodiment.

On page 7 of the Office Action, the Examiner further states:

Question (2)

As shown in Fig. 2 IB and pages 15-16, the Association requires computation according to the equation in page 16. In the equation, the Fourier transform of a delayed Gaussian filter are used to multiply each FS specified by parameter s. As discussed above with regard to recalling a FS, all the information related to each FS indexed with s and to FC indexed with m are not preserved after summation, without each

information of the infinite terms specified with indexes s and m, how can one perform calculation according to the equation in page 16? The same question also applied to the process of applying Gaussian filter to an input string shown in Fig. 21B.

The answer to this question is provided in the preceding section of this Brief. For example, on page 11, line 26 to page 12, line 2 the specification teaches:

> In one embodiment, the characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$. The modulation corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay. The characteristic modulation is encoded as a delay in time by storing the Fourier series in a specific portion of the Input Layer section of the memory wherein the specific portion has $n+1$ sub time intervals. Each sub time interval corresponds to a frequency band.
>
> In an alternative embodiment, the characteristic modulation, having a frequency within the band is represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$. Thus, the Fourier series in Fourier space may be:
>
> $$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$
>
> wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters. The data parameters are selected in the same manner as described above.

These teachings demonstrate how one of ordinary skill in the art can perform calculations according to the equation on page 16 and how to apply a Gaussian filter to an input string shown in Fig. 21B.

The Examiner further states on page 7 of the Office Action:

> Question (3)

The probability expectation value is calculated based on the equation in line 7, of page 14 and in Fig. 21B. Values of the amplitude of spectral similarity, $ß_s^2$ and frequency difference angle, $ø_s$, are need for the equation. As Explained above, after the formation of Fourier series, the parameters N_{ml}, P_{oml}, N_{m2}, P_{Om2} are not preserved. How are the parameters N_{ml}, P_{oml}, N_{m2}, P_{Om2} recovered in steps 34 and/or 36 of Fig. 2 so they can be used in last equation of page 14 to calculate the amplitude of spectral similarity, $ß_s^2$, and in the first equation in page 15 to calculate frequency difference angle, $ø_s$ between at least two filtered or unfiltered FSs, or a FS and a string?

The answer to this question can also be found in the preceding section of this Brief. For example, on page 13, line 27 to page 15, line 18 the specification teaches:

The filter 34 can be a time delayed Gaussian filter in the time domain. The filter may be characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ is a delay parameter, α is a half-width parameter, and t is the time parameter. The Gaussian filter may comprise a plurality of cascaded stages each stage having a decaying exponential system function between stages. The filter, in frequency space, can be characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter. The probability distribution may be Poissonian. Thus, the probability expectation value can be based upon Poissonian probability. The probability expectation value may be characterized by

$$\prod_s \left[p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right) \exp\left[-\beta_s^{-2}\left(\frac{1-\cos 2\phi_s}{2}\right)\right] \cos\left(\delta_s + 2\sin\phi_s\right)\right]$$

wherein P is the maximum probability of at least one other Fourier series being associated with a first Fourier series, $p_{\uparrow_s}$ is a probability of at least one other Fourier series being associated with a first Fourier series in the absence of coupling of the first Fourier series with the at least one other Fourier series, β_s^2 is a number that represents the amplitude of spectral

similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor. β_s^2 may be characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}}$$

$$\sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s} \exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} - \frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} \right)^2}{2} \right\}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters. The data parameters are selected in the same manner as described above. ϕ_s may be characterized by

$$\phi_s = \frac{\pi \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1} \frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} - \sum_{m_s=1}^{M_s} \frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} \right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1} \frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}}}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters. The data parameters are selected in the same manner as described above.

Based on Appellant's originally filed disclosure, the data parameters are completely recoverable, and the claimed invention is operable to achieve pattern recognition and processing.

Accordingly, withdrawal of Section 112 rejection is respectfully requested.

III. Claims 51-322 Comply With 35 U.S.C. § 101

The rejection of claims 51-322 under 35 U.S.C. § 101 as being non-operational and lacking utility is respectfully traversed. The claimed invention fully meets the requirements of Section 101 for the following reasons.

On pages 8-10 of the Office Action, the Examiner argues that:

> The embodiment of the application is disclosed in Figs. 1-2. It comprises an input layer, an association layer, a string ordering layer, a predominant configuration layer, and a memory. All Claims 51-322 are supported by these five elements. When any one of the above elements is not operative, it does not have any utility.
>
> In the specification, the Applicant correctly pointed out that the following equation in page 40 describes how a time function can be delayed by multiplying a factor $e^{-j2\pi f}o$ to each corresponding component $e^{j2\pi f}$ in Fourier space
>
> | | $x(t)=\int_{-\infty}^{\infty} X(f)e^{j2\pi ft}df$ | | $X(f)=\int_{-\infty}^{\infty} x(t)e^{-j2\pi ft}dt$ | |
> |---|---|---|---|---|
> | *Delay* | $\delta(t-t_0)$ | $\Leftrightarrow$ | $e^{-j2\pi ft_0}$ | (37.109) |
>
> ---- (1)
>
> This is a key step in storing different Fourier components or series in different memories with defined delay information that is later used to recall the stored series or strings for comparison and association. As shown in the above equation that there is an important attribute for this process to work: the multiplying a factor $e^{-j2\pi f}o$ shall have the exact same frequency f such as that of $e^{j2\pi f}$. Please note here that frequency f and its

negative counterpart -fare considered as two different frequencies. The Applicant also teaches in page 8 a Fourier series as shown below with k_p and k_z, as two parameters of Fourier space.

$$\boxed{\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho 0}}N_{m_{z0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)}$$

--- (2)

The Applicant considered k_p as one of the frequency and expressed its delayed correspondence in page 11 as shown below with the exponential factor in front of the first "sin".

$$\boxed{\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho 0}}N_{m_{z0}}e^{-jk_\rho(\rho_{k_m}+\rho_{i_m})}\sin\left(k_\rho\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho 0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z0}}}{2}\right)}$$

--- (3)

Equation (3) cannot produce the needed delay, because the following reasons.

-- It is well known that sin (fx) = $(e^{jfx} + e^{-jfx})/(2j)$. So the first sine function in equation (3) above has two frequencies, a pair of positive and negative f. However, the exponential factor in front of the first "sin" corresponds only to one f, the positive frequency f.

-- Furthermore its multiplication factor for the proposed process for generating delay does not have the exact same frequency f. Their frequencies are listed in the table below. The first sine function in equation (3) has a frequency depending on the data parameters, which are associated with the measured information that can vary from measurement to measurement. They are not related to time. As expressed in page 11, the exponential factor in front of the first "sin" is related to time through time delays.

function	frequency
$\sin\left(k_p \frac{N_{m_{p0}} \rho_{0_m}}{2} - n\frac{2\pi N_{m_{p0}}}{2}\right)$	$\pm \quad k_p \frac{N_{m_{p0}} \rho_{0_m}}{2}$
$e^{-jk_\rho\left(\rho_{p_m} + \rho_{i_m}\right)}$	k_ρ

Now it is evidently that the equation appearing in page 11 of the present specification cannot generate any delayed form of its corresponding function of that shown in page 8. Therefore, the recall of data will be correlated to its corresponding input data. Data can be stored in a memory. However, the stored data cannot be meaningfully recalled. As a consequence, meaningful comparison, recognition, and association cannot be achieved. It results no utility of the presently claimed invention because recognition and association are not operative.

Here again, the Examiner misapprehends Appellant's invention. While the layers may function independently of each other, a preferred embodiment comprises their use in concert. For example, it is possible to perform associations in the Association Layer without its activation controlled by the Predominant Configuration Layer, and, Strings can be ordered independently in the String Ordering Layer independent of both.

Appellant respectfully submits that the Examiner's misunderstanding of the present invention is based on preconceptions regarding conventional Fourier series of the prior art. On page 40 of the specification, Appellant describes how a time delay of t_0 gives rise to a modulation factor in Fourier space:

$$x(t) = \int_{-\infty}^{\infty} X(f) e^{j2\pi ft} df \qquad X(t) = \int_{-\infty}^{\infty} x(t) e^{-j2\pi ft} dt$$

$$\textit{Delay} \qquad \delta(t - t_0) \quad \Leftrightarrow \quad e^{-j2\pi ft_0} \tag{37.109}$$

Appellant respectfully submits that the Examiner is confused on several points. There is no multiplication by a factor $e^{-j2\pi f_0}$ in Eqs. (2) and (3). This is simply a constant complex number. The modulation factor shown in Siebert, W., Circuits, Signals, and Systems, The MIT Press, Cambridge, Massachusetts, (1986), pp. 415-416 is $e^{-j2\pi f t_0}$, wherein the running Fourier variable f of $X(f)$ is the same as that of the modulation factor.

Furthermore, Appellant respectfully submits that the Examiner is confused about the range of f since it is not two exact frequencies $-f_0$ and f_0. Rather, it is a free running variable in Fourier space. Similarly, k_ρ and k_z are free running variables in Fourier space. The data parameters modify these variables in the modulation factor and in the Fourier-term.

Lastly, Appellant respectfully submits that the Examiner is confused about the nature of the sine function. The Examiner has shown an equality between the forms on both sides of his equation, wherein Appellant has used the simplified LHS form in Eqs. (2) and (3). Here again, as used by Appellant, f is a running variable such that the argument about having only two frequencies $-f_0$ and f_0 is nonsensical.

It also appears that the Examiner is confusing the sine function with its Fourier transform, which is nonzero only at frequencies $-f_0$ and f_0 as shown in Siebert, W., Circuits, Signals, and Systems, The MIT Press, Cambridge, Massachusetts, (1986), pp. 415-416:

$$x(t) = \int_{-\infty}^{\infty} X(f) e^{j2\pi f t}\, df \qquad X(t) = \int_{-\infty}^{\infty} x(t) e^{-j2\pi f t}\, dt$$

$$\sin 2\pi f_0 t \qquad \Leftrightarrow \qquad \frac{\delta(f - f_0) - \delta(f + f_0)}{2j}$$

Appellant, however, is correctly using the sine function in Fourier space, wherein it is parameterized with the data and k_ρ and k_z are free running variables in Fourier space.

As previously stated, an embodiment of Appellant's invention has been peer reviewed and published. This demonstrates that those skilled in the art are fully capable of practicing the claimed invention.

Furthermore, the modulation factors are data parameters that can be related to time through their formatting and organization in the memory. For example, on page 11, line 18 to page 12, line 2, the specification teaches:

> In one embodiment, the characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$. The modulation corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay. The characteristic modulation is encoded as a delay in time by storing the Fourier series in a specific portion of the Input Layer section of the memory wherein the specific portion has $n+1$ sub time intervals. Each sub time interval corresponds to a frequency band.
>
> In an alternative embodiment, the characteristic modulation, having a frequency within the band is represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$. Thus, the Fourier series in Fourier space may be:
>
> $$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$
>
> wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters. The data parameters are selected in the same manner as described above.

The data parameters are recoverable in terms of their effect on the achievement of pattern recognition and processing. This can be appreciated by considering their impact on the results of association and ordering as given in the equations that follow. For example, on page 8, line 19 to page 9, line 9, the specification teaches:

> For example the Fourier series in Fourier space may be:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z_0}}z_{0_m}}{2}\right)$$

having a quantized amplitude, frequency, and phase angle, wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are the data parameters.

In a first embodiment, the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component are proportional to the rate of change of the physical characteristic. Each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic. In the triangle example, the amplitude of the voltage at a given CCD element relative to the neighboring CCD element defines the rate of change of the voltage which is converted into the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$. The inverse of the amplitude of the voltage of each CCD element is converted into the data parameters ρ_{0_m} and z_{0_m}. As illustrated in FIGURE 3 and described above, for each CCD element, the Fourier series, parameterized accordingly, are stored to a specific sub register 27 of a specific register 26 of the Input Layer section 24 of the memory 20. Since the structure of a Fourier series is known in the art, only the parameters need to be stored in a digital embodiment.

As a further example, on page 18, line 23 to page 21, line 5, the specification teaches:

Each filter of the set of filters can be a time delayed Gaussian filter having a half-width parameter α which determines the amount of the string that is sampled. Each filter of the set of filters can be a time delayed Gaussian filter having a delay parameter $\frac{\sqrt{N}}{\alpha}$ which corresponds to a time point. Each Fourier series of the ordered string can be multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz 0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz 0}}}{\alpha_{sz0}}(v_{sz 0}k_z)}$. The filter established the correct order. The ordered string can be represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters. The data parameters are selected in the same manner as described above.

The probability expectation value may be based upon Poissonian probability. The probability expectation value is represented by

$$\prod_s\left[p_{\uparrow_s}+\left(P-p_{\uparrow_s}\right)\exp\left[-\beta_s^{-2}\left(\frac{1-\cos 2\phi_s}{2}\right)\right]\cos\left(\delta_s+2\sin\phi_s\right)\right]$$

wherein P is the maximum probability of at least one other Fourier series being associated with a first Fourier series, $p_{\uparrow_s}$ is a probability of at least one other Fourier series being associated with a first Fourier series in the absence of coupling of the first Fourier series with the at least one other Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor. β_s^2 may be characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$

$$\exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}} \right) - \left(\frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}} \right) \right)^2}{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters. The data parameters are selected in the same manner as described above. ϕ_s may be represented by

$$\phi_s = \frac{\pi \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1} \left(\frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}} \right) - \sum_{m_s=1}^{M_s} \left(\frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}} \right) \right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1} \left(\frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}} \right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal

propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters. The data parameters are selected in the same manner as described above.

The following is a comparison of a Standard Fourier Transform to Appellant's Fourier Series in Fourier Space:

STANDARD FOURIER TRANSFORM

Fourier Series

$$x(t) = a_0 + \sum_{n=1}^{N} a_n \cos\frac{2\pi nt}{T} + \sum_{n=1}^{N} b_n \cos\frac{2\pi nt}{T}$$

$$a_0 = \frac{1}{T}\int_0^T x(t)dt$$

$$a_m = \frac{2}{T}\int_0^T x(t)\cos\frac{2\pi mt}{T}\,dt \qquad m \neq 0$$

$$b_m = \frac{2}{T}\int_0^T x(t)\cos\frac{2\pi mt}{T}\,dt \qquad m \neq 0$$

Sinusoids whose frequencies are integer multiples of some fundamental frequency, $f_0 = \frac{1}{T}$, form an orthogonal set of functions, that is,

$$\frac{2}{T}\int_0^T \sin\frac{2\pi nt}{T}\cos\frac{2\pi mt}{T}\,dt = 0, \quad \text{all } n,m$$

$$\frac{2}{T}\int_0^T \sin\frac{2\pi nt}{T}\sin\frac{2\pi mt}{T}\,dt = \frac{2}{T}\int_0^T \cos\frac{2\pi nt}{T}\cos\frac{2\pi mt}{T}\,dt$$

$$= \begin{cases} 0, & n \neq m \\ 1, & n = m \neq 0 \end{cases}$$

Exponential Form of Fourier Series

$$x(t) = \sum_{n=-\infty}^{\infty} X[n] e^{j2\pi nt/T}$$

$$X[n] = \frac{1}{T}\int_{-T/2}^{T/2} x(t) e^{-j2\pi nt/T}\,dt$$

Fourier Integral

$$x(t) = \int_{-\infty}^{\infty} X(f) e^{j2\pi ft}\,df$$

$$X(f) = \int_{-\infty}^{\infty} x(t) e^{-j2\pi ft}\,dt$$

Discrete-Time Fourier Transform

$$x[n] = \int_{-1/2}^{1/2} X(\phi) e^{j2\pi\phi n}\,d\phi$$

$$X(\phi) = \sum_{n=-\infty}^{\infty} x[n] e^{-j2\pi\phi n}$$

Discrete Fourier Transform

$$x[n] = \sum_{m=0}^{N-1} X[m] e^{j2\pi mn/N}$$

$$X[m] = \frac{1}{N} \sum_{n=0}^{N-1} x[n] e^{-j2\pi mn/N}$$

FOURIER SERIES IN FOURIER SPACE

Each Fourier component of the Fourier series may comprise a quantized amplitude, frequency, and phase angle. For example the Fourier series in Fourier space may be:

$$\sum_{m=1}^{M} \sum_{n=-\infty}^{\infty} \frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_m} N_{m_{\rho_0}} N_{m_{z_0}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z_0}} z_{0_m}}{2}\right)$$

$$\sum_{m=1}^{M} \sum_{n=-\infty}^{\infty} \frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_m} N_{m_{\rho_0}} N_{m_{z_0}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z_0}} z_{0_m}}{2}\right)$$

having a quantized amplitude, frequency, and phase angle, wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are the data parameters.

In a first embodiment, the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component are proportional to the rate of change of the physical characteristic. Each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

In a second embodiment, each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic. Each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

In a third embodiment, each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of the signal response of each transducer. Each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

For all of these reasons, claims 51-322 fully comply with 35 U.S.C. § 101. Accordingly, withdrawal of the Section 101 rejection is respectfully requested.

Conclusion

In view of the foregoing arguments, all of the pending claims 51-322 fully comply with 35 U.S.C. §§ 101 and 112, first paragraph. Accordingly, Appellant respectfully requests that the Board withdraw the Examiner's rejections of claims 51-322 and allow all of the claims in this case.

Respectfully submitted,

By ______________________

Jeffrey S. Melcher
Reg. No.: 35,950
Tel. No.: 202.261.1045
Fax. No.: 202.887.0336

Customer No. 20736

Manelli, Denison & Selter, PLLC
2000 M Street, N.W.
7th Floor
Washington, D.C. 20036-3307

(viii) Claims Appendix

51. (Previously Presented) A method for recognizing a pattern in information comprising data, the method comprising:

inputting data;

encoding data as parameters of a plurality of Fourier components in Fourier space;

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

determining a spectral similarity between said modulated Fourier series and another Fourier series;

determining a probability expectation value based on said spectral similarity;

generating a probability operand based on said probability expectation value;

selecting a desired value for said probability operand, wherein recognition of a pattern in said information is obtained when said probability operand having said desired value; and

outputting a recognized pattern.

52. (Previously Presented) A method according to claim 51, further comprising adding said modulated Fourier series and said another Fourier series to form a string of Fourier series in Fourier space when said probability operand has said desired value.

53. (Previously Presented) A method according to claim 52, further comprising storing said string of Fourier series to a memory.

54. (Previously Presented) A method according to claim 51, wherein said another Fourier series represents known information.

55. (Previously Presented) A method according to claim 51, wherein said steps of adding said plurality of Fourier components together, sampling at least one of said plurality of Fourier series in Fourier space, modulating said sampled Fourier series in Fourier space, determining a spectral similarity between said modulated Fourier series and another one of said plurality of Fourier series, determining a probability expectation value, and generating a probability operand are repeated until a said probability operand has said desired value.

56. (Previously Presented) A method according to claim 51, wherein said value of said probability operand is selected from a set of zero and one; and wherein said desired value is one.

57. (Previously Presented) A method according to claim 51, wherein said step of encoding data further comprises modulating at least one of said Fourier components to provide an input context.

58. (Previously Presented) A method according to claim 57, wherein inputted information comprises said data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

59. (Previously Presented) A method according to claim 51, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

60. (Previously Presented) A method according to claim 51, wherein said step of adding at least two Fourier components together is conducted to provide at least two Fourier series.

61. (Previously Presented) A method according to claim 51, wherein said data is representative of physical characteristics and said Fourier series in Fourier space is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}\frac{4}{\rho_{0_m}z_{0_m}}a_{0_m}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

62. (Previously Presented) A method according to claim 61, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to a rate of change of said physical characteristics, and each of ρ_{0_m} and z_{0_m} is inversely proportional to an amplitude of said physical characteristics.

63. (Previously Presented) A method according to claim 61, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to said amplitude of said physical characteristics, and each of ρ_{0_m} and z_{0_m} is inversely proportional to said rate of change of said physical characteristics.

64. (Previously Presented) A method according to claim 61, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to a duration of a signal response of at least one input transducer; and each of ρ_{0_m} and z_{0_m} is inversely proportional to said physical characteristics.

65. (Previously Presented) A method according to claim 57, wherein step of encoding said data further comprises encoding said input context as a characteristic time delay which corresponds to a characteristic modulation of said Fourier components or Fourier series at a frequency within a band.

66. (Previously Presented) A method according to claim 65, wherein said characteristic modulation frequency band represents said input context according to at least one of a transducer, specific transducer element, and fundamental relationships including a physical context, a temporal order, a cause and effect relationship including a temporal order, a size order, an intensity order, a before-and-after order, a top-and-bottom order, and a left-and-right order.

67. (Previously Presented) A method according to claim 66, wherein said transducer has n levels of subcomponents, and is assigned a master time interval with n+1 sub time intervals in a hierarchical manner corresponding to said n levels of the transducer subcomponents, and wherein a data stream from a n^{th} level subcomponent of said transducer is recorded as a function of time in the n+1 sub time intervals, each of said n+1 time intervals representing a time delay that corresponds to said characteristic modulation frequency band representing said input context.

68. (Previously Presented) A method according to claim 67, wherein the input context is based on the identity of the specific transducer and transducer subcomponents.

69. (Previously Presented) A method according to claim 65, wherein the characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$ which corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay.

70. (Previously Presented) A method according to claim 69, wherein the step of adding at least two Fourier components together further comprises storing the characteristic modulation frequency in a distinct memory location within the band encoded as a delay in time.

71. (Previously Presented) A method according to claim 69, wherein the Fourier series in Fourier space, has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ and is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho 0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z0}}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}\frac{4}{\rho_{0_m}z_{0_m}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho 0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z0}}}{2}\right)$$

wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

72. (Previously Presented) A method according to claim 71, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

73. (Previously Presented) A method according to claim 71, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and

z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

74. (Previously Presented) A method according to claim 71, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

75. (Previously Presented) A method according to claim 69, wherein the string has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ is selected from one of:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$
$$\operatorname{sin}\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\operatorname{sin}\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

and

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}\frac{4}{\rho_{0_{s,m}}z_{0_{s,m}}}e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$
$$\operatorname{sin}\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\operatorname{sin}\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $\rho_{t_{s,m}}=v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}}=v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

76. (Previously Presented) A method according to claim 75, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

77. (Previously Presented) A method according to claim 75, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

78. (Previously Presented) A method according to claim 75, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

79. (Previously Presented) A method according to claim 51, wherein the Fourier series in Fourier space, has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ and is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}\frac{4}{\rho_{0_m}z_{0_m}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

80. (Previously Presented) A method according to claim 79, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

81. (Previously Presented) A method according to claim 79, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

82. (Previously Presented) A method according to claim 79, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

83. (Previously Presented) A method according to claim 79, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

84. (Previously Presented) A method according to claim 83, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the

rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

85. (Previously Presented) A method according to claim 83, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

86. (Previously Presented) A method according to claim 83, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

87. (Previously Presented) A method according to claim 51, wherein the step of adding at least two of said Fourier components together further comprises creating transducer strings by obtaining a Fourier series from at least two selected transducers and adding the Fourier series.

88. (Previously Presented) A method according to claim 87, further comprises selecting transducers that are active simultaneously.

89. (Previously Presented) A method according to claim 88, wherein the transducer string is stored in a distinct memory location wherein a characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$ which corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay.

90. (Previously Presented) A method according to claim 89, wherein the step of adding at least two of said Fourier components together further comprises recalling any part of the transducer string from the distinct memory location which thereby causes additional Fourier series of the transducer string to be recalled.

91. (Previously Presented) A method according to claim 51, wherein the filter is a time delayed Gaussian filter in the time domain.

92. (Previously Presented) A method according to claim 91, wherein the Gaussian filter comprises a plurality of cascaded stages each stage having a decaying exponential system function between stages.

93. (Previously Presented) A method according to claim 92, wherein the Gaussian filter is modulated in the time domain to produce a frequency shift of the sampling and modulation in the frequency domain.

94. (Previously Presented) A method according to claim 91, wherein the filter is characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{-\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ is a delay parameter, α is a half-width parameter, and t is the time parameter.

95. (Previously Presented) A method according to claim 94, wherein the filter, in frequency space, is characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter.

96. (Previously Presented) A method according to claim 51, wherein the probability expectation value is based upon Poissonian probability.

97. (Previously Presented) A method according to claim 96, wherein the probability expectation value is characterized by

$$\prod_s \left[p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right) \exp\left[-\beta_s^{2}\left(\frac{1-\cos 2\phi_s}{2}\right)\right] \cos\left(\delta_s + 2\sin\phi_s\right)\right]$$

wherein P is the maximum probability of at least one other Fourier series being associated with a first Fourier series, $p_{\uparrow_s}$ is a probability of at least one other Fourier

series being associated with a first Fourier series in the absence of coupling of the first Fourier series with the at least one other Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor.

98. (Previously Presented) A method according to claim 97, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}}$$

$$\sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s} \exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} - \frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} \right)^2}{2} \right\}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

99. (Previously Presented) A method according to claim 98, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

100. (Previously Presented) A method according to claim 98, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m}. of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

101. (Previously Presented) A method according to claim 98, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

102. (Previously Presented) A method according to claim 97, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} - \sum_{m_s=1}^{M_s} \frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

103. (Previously Presented) A method according to claim 102, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

104. (Previously Presented) A method according to claim 102, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

105. (Previously Presented) A method according to claim 102, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data

parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

106. (Previously Presented) A method according to claim 97, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$

$$\exp-\left\{ \frac{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)^2}{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

107. (Previously Presented) A method according to claim 106, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

108. (Previously Presented) A method according to claim 106, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m}

and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

109. (Previously Presented) A method according to claim 106, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

110. (Previously Presented) A method according to claim 97, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fbm_1}}{v_{fbm_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fbm_s}}{v_{fbm_s}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fbm_1}}{v_{fbm_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fbm_1} = v_{fbm_1} t_{fbm_1}$ and $\rho_{fbm_s} = v_{fbm_s} t_{fbm_s}$ are the modulation factors which corresponds to the specific transducer time delay t_{fbm_1} and t_{fbm_s}, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, v_{fbm_1}, and v_{fbm_s} are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

111. (Previously Presented) A method according to claim 110, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

112. (Previously Presented) A method according to claim 110, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

113. (Previously Presented) A method according to claim 110, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

114. (Previously Presented) A method according to claim 51, further comprising linking at least two Fourier series stored in a memory comprising the steps of

a.) generating a probability expectation value that recalling any part of one of the Fourier series from the memory causes at least another Fourier series to be recalled from the memory;

b.) storing the probability expectation value to memory;

c.) generating a probability operand based on the probability expectation value, and

d.) recalling the at least another Fourier series from the memory if the operand has a desired value.

115. (Previously Presented) A method according to claim 114, wherein said probability operand is a value selected from a set of zero and one value selected from a set of zero and one.

116. (Previously Presented) A method according to claim 115, wherein said desired value is one.

117. (Previously Presented) A method according to claim 114, whereby the probability expectation value increases with a rate of recalling any part of any of the Fourier series.

118. (Previously Presented) A method for recognizing a pattern in information, the method comprising:

inputting information;

representing the information as a plurality of Fourier series in Fourier space;

forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters and by coupling the filtered Fourier series based on a probability distribution, wherein when at least two of the Fourier series have been associated recognition of a pattern in the information is achieved; and

outputting a recognized pattern in the information.

119. (Previously Presented) A method according to claim 118, wherein coupling is based on spectral similarity of said Fourier series.

120. (Previously Presented) A method according to claim 118, further comprising adding the associated Fourier series to form a string, and ordering the string.

121. (Previously Presented) A method according to claim 118, wherein the filter is a time delayed Gaussian filter in the time domain.

122. (Previously Presented) A method according to claim 118, wherein the probability distribution is Poissonian.

123. (Previously Presented) A method according to claim 120, wherein the string is selected from one of:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho 0}}N_{s,m_{z0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

and

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}\frac{4}{\rho_{0_{s,m}}z_{0_{s,m}}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho 0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

124. (Previously Presented) A method according to claim 123, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

125. (Previously Presented) A method according to claim 123, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

126. (Previously Presented) A method according to claim 123, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

127. (Previously Presented) A method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the method comprising:

a.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

b.) selecting at least two filters from a selected set of filters;

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

h.) determining a probability expectation value based on the spectral similarity;

i.) generating a probability operand based on the probability expectation value;

j.) repeating steps b-i until the probability operand has a desired value, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

k.) storing the summed Fourier series to an intermediate memory;

l.) removing the selected filters from the selected set of filters to form an updated set of filters;

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability operand has a desired value a pattern in information has been recognized an order formatted pattern in the information has been established;

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

aa.) storing the Fourier series in the intermediate memory in the high level memory.

128. (Previously Presented) A method according to claim 127, wherein information is represented by a sum of Fourier series in Fourier space.

129. (Previously Presented) A method according to claim 127, further comprising encoding data which includes modulating at least one of said Fourier components to provide an input context.

130. (Previously Presented) A method according to claim 127, wherein inputted information comprises data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

131. (Previously Presented) A method according to claim 127, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

132. (Previously Presented) A method according to claim 127, wherein said probability operands having a value selected from a set of zero and one.

133. (Previously Presented) A method according to claim 132, wherein said desired values are one.

134. (Previously Presented) A method according to claim 127, wherein the high level memory is initialized with standard inputs.

135. (Previously Presented) A method according to claim 127, wherein the ordering is according to one of temporal order, cause and effect relationships, size order, intensity order, before-after order, top-bottom order, or left-right order.

136. (Previously Presented) A method according to claim 127, wherein each filter of the set of filters is a time delayed Gaussian filter having a half-width parameter α which determines the amount of the string that is sampled.

137. (Previously Presented) A method according to claim 127, wherein each filter of the set of filters is a time delayed Gaussian filter having a delay parameter $\frac{\sqrt{N}}{\alpha}$ which corresponds to a time point.

138. (Previously Presented) A method according to claim 137, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the correct order to form the string, wherein the ordered string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

139. (Previously Presented) A method according to claim 138, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

140. (Previously Presented) A method according to claim 138, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

141. (Previously Presented) A method according to claim 138, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

142. (Previously Presented) A method according to claim 138, wherein $v_{s,m}t_{0_{s,m}} = \rho_{0_{s,m}}$ and $k_\rho = k_z$ such that the string in Fourier space is one dimensional in terms of k_ρ and is represented by

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-jk_\rho \rho_{fb_{s,m}}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ is a constant such as the signal propagation velocity in the ρ direction, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ is a delay parameter and $\alpha_{s\rho 0}$ is a half-width parameter of a corresponding Gaussian filter in the k_ρ-space, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{fb_{s,m}}$ is a constant such as the signal propagation velocity, $a_{0_{s,m}}$ is a constant, k_ρ is the frequency variable, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$ and $\rho_{0_{s,m}}$ are data parameters.

143. (Previously Presented) A method according to claim 142, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

144. (Previously Presented) A method according to claim 142, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m}

and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

145. (Previously Presented) A method according to claim 142, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

146. (Previously Presented) A method according to claim 127, wherein the probability expectation value is based upon Poissonian probability.

147. (Previously Presented) A method according to claim 146, wherein the probability expec characterized by

$$\prod_s \left[p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right) \exp\left[-\beta_s^{-2} \left(\frac{1-\cos 2\phi_s}{2} \right) \right] \cos\left(\delta_s + 2\sin\phi_s\right) \right]$$

wherein P is the maximum probability that at least one other Fourier series is active given that a first Fourier series is active, $p_{\uparrow_s}$ is a probability of a Fourier series becoming active in the absence of coupling from at least one other active Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor.

148. (Previously Presented) A method according to claim 147, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$

$$\exp - \left\{ \frac{ \frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}} \right) - \left(\frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}} \right) \right)^2 }{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and

$\rho_{fbm_s} = v_{fbm_s} t_{fbm_s}$ are the modulation factors which corresponds to the specific transducer time delay t_{fbm_1} and t_{fbm_s}, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, v_{fbm_1}, and v_{fbm_s} are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data.

149. (Previously Presented) A method according to claim 148, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

150. (Previously Presented) A method according to claim 148, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

151. (Previously Presented) A method according to claim 148, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

152. (Previously Presented) A method according to claim 148, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fbm_1}}{v_{fbm_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fbm_s}}{v_{fbm_s}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fbm_1}}{v_{fbm_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

153. (Previously Presented) A method according to claim 152, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

154. (Previously Presented) A method according to claim 152, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

155. (Previously Presented) A method according to claim 152, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

156. (Previously Presented) A system for recognizing a pattern in information comprising data and establishing an order formatted pattern in information, the system comprising:

an input layer that receives data representative of physical characteristics or representations of physical characteristics within an input context of the physical

characteristics and transforms the data into a Fourier series in Fourier space wherein the input context is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies;

a memory comprising a set of initial ordered Fourier series;

an association layer that receives a plurality of the Fourier series in Fourier space from the memory, recognizes a pattern in information represented by the Fourier series, forms a string comprising a sum of Fourier series, and stores the string in memory;

a string ordering layer that receives the string and at least one ordered Fourier series from the memory, orders the Fourier series contained in the string by establishing an order formatted pattern in information to form an ordered string, and stores the ordered string in memory; and

a predominant configuration layer that receives multiple ordered strings from the memory, forms complex ordered strings from the ordered strings, stores the complex ordered strings to the memory, and activates the components of any of the layers of the system to recognize a pattern in information and establish an order formatted pattern in information.

157. (Previously Presented) A method of recognizing a pattern in information, the method comprising:

a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on an activation rate of the corresponding component;

b.) storing the activation probability parameter in memory;

c.) generating a probability operand based on the activation probability parameter;

d.) if said probability operand is a desired value, activating any component of one or more of the group consisting of an input layer, an association layer, a string ordering layer, and a predominant configuration layer, the activation being based on the activation probability parameter, wherein a pattern in information is recognized when said probability operand is said desired value;

e.) repeating steps a-d until a pattern is recognized in the information.

158. (Previously Presented) A method according to claim 157, wherein said probability operand having a value selected from a set of zero and one.

159. (Previously Presented) A method according to claim 158, wherein said desired value is one.

160. (Previously Presented) A computer-readable medium on which is stored a computer program for providing (Previously Presented) A method for recognizing a pattern in information comprising data, the computer program comprising instructions which, when executed by a computer, perform the steps of:

encoding data as parameters of a plurality of Fourier components in Fourier space;

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

determining a spectral similarity between said modulated Fourier series and another Fourier series;

determining a probability expectation value based on said spectral similarity;

generating a probability operand based on said probability expectation value; and

selecting a desired value for said probability operand, wherein recognition of a pattern in said information is obtained when said probability operand having said desired value.

161. (Previously Presented) A computer-readable medium according to claim 160, wherein said data is inputted from a transducer which transduces physical data into computer readable data.

162. (Previously Presented) A computer-readable medium according to claim 160, further comprising adding said modulated Fourier series and said

another Fourier series to form a string of Fourier series in Fourier space when said probability operand has said desired value.

163. (Previously Presented) A computer-readable medium according to claim 162, further comprising storing said string of Fourier series to a memory.

164. (Previously Presented) A computer-readable medium according to claim 160, wherein said another Fourier series represents known information.

165. (Previously Presented) A computer-readable medium according to claim 160, wherein said steps of adding said plurality of Fourier components together, sampling at least one of said plurality of Fourier series in Fourier space, modulating said sampled Fourier series in Fourier space, determining a spectral similarity between said modulated Fourier series and another one of said plurality of Fourier series, determining a probability expectation value, and generating a probability operand are repeated until a said probability operand has said desired value.

166. (Previously Presented) A computer-readable medium according to claim 160, wherein said value of said probability operand is selected from a set of zero and one; and wherein said desired value is one.

167. (Previously Presented) A computer-readable medium according to claim 160, wherein said step of encoding data further comprises modulating at least one of said Fourier components to provide an input context.

168. (Previously Presented) A computer-readable medium according to claim 160, wherein inputted information comprises said data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

169. (Previously Presented) A computer-readable medium according to claim 168, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

170. (Previously Presented) A computer-readable medium according to claim 160, wherein said step of adding at least two Fourier components together is conducted to provide at least two Fourier series.

171. (Previously Presented) A computer-readable medium according to claim 160, wherein said data is representative of physical characteristics and said Fourier series in Fourier space is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}\frac{4}{\rho_{0_m}z_{0_m}}a_{0_m}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

172. (Previously Presented) A computer-readable medium according to claim 171, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to a rate of change of said physical characteristics, and each of ρ_{0_m} and z_{0_m} is inversely proportional to an amplitude of said physical characteristics.

173. (Previously Presented) A computer-readable medium according to claim 171, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to said amplitude of said physical characteristics, and each of ρ_{0_m} and z_{0_m} is inversely proportional to said rate of change of said physical characteristics.

174. (Previously Presented) A computer-readable medium according to claim 171, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to a duration of a signal response of at least one input transducer; and each of ρ_{0_m} and z_{0_m} is inversely proportional to said physical characteristics.

175. (Previously Presented) A computer-readable medium according to claim 167, wherein step of encoding said data further comprises encoding said input context as a characteristic time delay which corresponds to a characteristic modulation of said Fourier components or Fourier series at a frequency within a band.

176. (Previously Presented) A computer-readable medium according to claim 175, wherein said characteristic modulation frequency band represents said input context according to at least one of a transducer, a specific transducer element, and at least one of fundamental relationship including a physical context, a temporal order, a cause and effect relationships including a temporal order, a size order, an intensity order, a before-and-after order, a top-and-bottom order, and a left-and-right order.

177. (Previously Presented) A computer-readable medium according to claim 176, wherein said transducer has n levels of subcomponents, and is assigned a master time interval with n+1 sub time intervals in a hierarchical manner corresponding to said n levels of the transducer subcomponents, and wherein a data stream from a n^{th} level subcomponent of said transducer is recorded as a function of time in the n+1 sub time intervals, each of said n+1 time intervals representing a time delay that corresponds to said characteristic modulation frequency band representing said input context.

178. (Previously Presented) A method according to claim 177, wherein the input context is based on the identity of the specific transducer and transducer subcomponents.

179. (Previously Presented) A computer-readable medium according to claim 177, wherein the characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$ which corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay.

180. (Previously Presented) A computer-readable medium according to claim 179, wherein the step of adding at least two Fourier components together further comprises storing the characteristic modulation frequency in a distinct memory location within the band encoded as a delay in time.

181. (Previously Presented) A computer-readable medium according to claim 179, wherein the Fourier series in Fourier space, has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ and is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho 0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z0}}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}\frac{4}{\rho_{0_m}z_{0_m}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho 0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z0}}}{2}\right)$$

wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

182. (Previously Presented) A computer-readable medium according to claim 181, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and

each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

183. (Previously Presented) A computer-readable medium according to claim 181, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

184. (Previously Presented) A computer-readable medium according to claim 181, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

185. (Previously Presented) A computer-readable medium according to claim 179, wherein the string has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ is selected from one of:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$

$$\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

and

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}\frac{4}{\rho_{0_{s,m}}z_{0_{s,m}}}e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$

$$\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $\rho_{t_{s,m}}=v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}}=v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

186. (Previously Presented) A computer-readable medium according to claim 185, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

187. (Previously Presented) A computer-readable medium according to claim 185, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

188. (Previously Presented) A computer-readable medium according to claim 185, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

189. (Previously Presented) A computer-readable medium according to claim 160, wherein the Fourier series in Fourier space, has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ and is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}\frac{4}{\rho_{0_m}z_{0_m}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

190. (Previously Presented) A computer-readable medium according to claim 189, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

191. (Previously Presented) A computer-readable medium according to claim 189, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

192. (Previously Presented) A computer-readable medium according to claim 189, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

193. (Previously Presented) A computer-readable medium according to claim 189, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho_0}$ and v_{sz_0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho_0}$ and α_{sz_0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical

time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

194. (Previously Presented) A method according to claim 193, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

195. (Previously Presented) A method according to claim 193, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

196. (Previously Presented) A method according to claim 193, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

197. (Previously Presented) A computer-readable medium according to claim 160, wherein the step of adding at least two of said Fourier components together further comprises creating transducer strings by obtaining a Fourier series from at least two selected transducers and adding the Fourier series.

198. (Previously Presented) A computer-readable medium according to claim 197, further comprises selecting transducers that are active simultaneously.

199. (Previously Presented) A computer-readable medium according to claim 198, wherein the transducer string is stored in a distinct memory location wherein a characteristic modulation having a frequency within the band in Fourier space is

represented by $e^{-j2\pi f t_0}$ which corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay.

200. (Previously Presented) A computer-readable medium according to claim 199, wherein the step of adding at least two of said Fourier components together further comprises recalling any part of the transducer string from the distinct memory location which thereby causes additional Fourier series of the transducer string to be recalled.

201. (Previously Presented) A computer-readable medium according to claim 160, wherein the filter is a time delayed Gaussian filter in the time domain.

202. (Previously Presented) A computer-readable medium according to claim 201, wherein the Gaussian filter comprises a plurality of cascaded stages each stage having a decaying exponential system function between stages.

203. (Previously Presented) A computer-readable medium according to claim 201, wherein the Gaussian filter is modulated in the time domain to produce a frequency shift of the sampling and modulation in the frequency domain.

204. (Previously Presented) A computer-readable medium according to claim 201, wherein the filter is characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ is a delay parameter, α is a half-width parameter, and t is the time parameter.

205. (Previously Presented) A computer-readable medium according to claim 201, wherein the filter, in frequency space, is characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter.

206. (Previously Presented) A computer-readable medium according to claim 160, wherein the probability expectation value is based upon Poissonian probability.

207. (Previously Presented) A computer-readable medium according to claim 206, wherein the probability expectation value is characterized by

$$\prod_s \left[p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right) \exp\left[-\beta_s^{-2} \left(\frac{1-\cos 2\phi_s}{2} \right) \right] \cos\left(\delta_s + 2\sin\phi_s\right) \right]$$

wherein P is the maximum probability of at least one other Fourier series being associated with a first Fourier series, $p_{\uparrow_s}$ is a probability of at least one other Fourier series being associated with a first Fourier series in the absence of coupling of the first Fourier series with the at least one other Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor.

208. (Previously Presented) A computer-readable medium according to claim 207, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}}$$

$$\sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s} \exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \frac{N_{m_1} \rho_{0_{m_1}}}{2v_{m_1}} - \frac{N_{m_s} \rho_{0_{m_s}}}{2v_{m_s}} \right)^2}{2} \right\}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

209. (Previously Presented) A computer-readable medium according to claim 208, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and

each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

210. (Previously Presented) A computer-readable medium according to claim 208, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

211. (Previously Presented) A computer-readable medium according to claim 208, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

212. (Previously Presented) A computer-readable medium according to claim 208, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} - \sum_{m_s=1}^{M_s} \frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

213. (Previously Presented) A computer-readable medium according to claim 212, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

214. (Previously Presented) A computer-readable medium according to claim 212, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

215. (Previously Presented) A computer-readable medium according to claim 212, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

216. (Previously Presented) A computer-readable medium according to claim 208, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s} \cdot$$

$$\exp - \left\{ \frac{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)^2}{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

217. (Previously Presented) A computer-readable medium according to claim 216, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

218. (Previously Presented) A computer-readable medium according to claim 216, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

219. (Previously Presented) A computer-readable medium according to claim 216, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

220. (Previously Presented) A computer-readable medium according to claim 208, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m1}}}{2v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m1}}}{2v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s}

are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

221. (Previously Presented) A computer-readable medium according to claim 220, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

222. (Previously Presented) A computer-readable medium according to claim 220, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

223. (Previously Presented) A computer-readable medium according to claim 220, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

224. (Previously Presented) A computer-readable medium according to claim 160, further comprising linking at least two Fourier series stored in a memory comprising the steps of

a.) generating a probability expectation value that recalling any part of one of the Fourier series from the memory causes at least another Fourier series to be recalled from the memory;

b.) storing the probability expectation value to memory;

c.) generating a probability operand based on the probability expectation value, and

d.) recalling the at least another Fourier series from the memory if the operand has a desired value.

225. (Previously Presented) A computer-readable medium according to claim 224, wherein said probability operand is a value selected from a set of zero and one.

226. (Previously Presented) A computer-readable medium according to claim 225, wherein said desired value is one.

227. (Previously Presented) A computer-readable medium according to claim 160, whereby the probability expectation value increases with a rate of recalling any part of any of the Fourier series.

228. (Previously Presented) A computer-readable medium on which is stored a computer program for providing (Previously Presented) A method for recognizing a pattern in information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

representing the information as a plurality of Fourier series in Fourier space; and

forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters and by coupling the filtered Fourier series based on a probability distribution, wherein when at least two of the Fourier series have been associated recognition of a pattern in the information is achieved.

229. (Previously Presented) A computer-readable medium according to claim 228, wherein coupling is based on spectral similarity of said Fourier series.

230. (Previously Presented) A computer-readable medium according to claim 228, further comprising adding the associated Fourier series to form a string, and ordering the string.

231. (Previously Presented) A computer-readable medium according to claim 228, wherein the filter is a time delayed Gaussian filter in the time domain.

232. (Previously Presented) A computer-readable medium according to claim 228, wherein the probability distribution is Poissonian.

233. (Previously Presented) A computer-readable medium according to claim 230, wherein the string is selected from one of:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

and

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}\frac{4}{\rho_{0_{s,m}}z_{0_{s,m}}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

234. (Previously Presented) A computer-readable medium according to claim 233, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

235. (Previously Presented) A computer-readable medium according to claim 233, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

236. (Previously Presented) A computer-readable medium according to claim 233, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

237. (Previously Presented) A computer-readable medium on which is stored a computer program for providing (Previously Presented) A method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

b.) selecting at least two filters from a selected set of filters;

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

h.) determining a probability expectation value based on the spectral similarity;

i.) generating a probability operand based on the probability expectation value;

j.) repeating steps b-i until the probability operand has a desired value, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

k.) storing the summed Fourier series to an intermediate memory;

l.) removing the selected filters from the selected set of filters to form an updated set of filters;

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

aa.) storing the Fourier series in the intermediate memory in the high level memory.

238. (Previously Presented) A computer-readable medium according to claim 237, wherein information is represented by a sum of Fourier series in Fourier space.

239. (Previously Presented) A computer-readable medium according to claim 237, further comprising encoding data which includes modulating at least one of said Fourier components to provide an input context.

240. (Previously Presented) A computer-readable medium according to claim 237, wherein inputted information comprises data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

241. (Previously Presented) A computer-readable medium according to claim 237, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

242. (Previously Presented) A computer-readable medium according to claim 237, wherein said probability operands having a value selected from a set of zero and one.

243. (Previously Presented) A computer-readable medium to claim 242, wherein said desired values are one.

244. (Previously Presented) A computer-readable medium to claim 237, wherein the high level memory is initialized with standard inputs.

245. (Previously Presented) A computer-readable medium to claim 237, wherein the ordering is according to one of the list of: temporal order, cause and effect relationships, size order, intensity order, before-after order, top-bottom order, or left-right order.

246. (Previously Presented) A computer-readable medium to claim 237, wherein each filter of the set of filters is a time delayed Gaussian filter having a half-width parameter α which determines the amount of the string that is sampled.

247. (Previously Presented) A computer-readable medium to claim 237, wherein each filter of the set of filters is a time delayed Gaussian filter having a delay parameter $\frac{\sqrt{N}}{\alpha}$ which corresponds to a time point.

248. (Previously Presented) A computer-readable medium to claim 247, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the correct order to form the string, wherein the ordered string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho 0}} N_{s,m_{z0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho 0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

249. (Previously Presented) A computer-readable medium to claim 248, wherein each of the data parameters $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

250. (Previously Presented) A computer-readable medium to claim 248, wherein each of the data parameters $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

251. (Previously Presented) A computer-readable medium to claim 248, wherein each of the data parameters $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

252. (Previously Presented) A computer-readable medium to claim 248, wherein $v_{s,m} t_{0_{s,m}} = \rho_{0_{s,m}}$ and $k_\rho = k_z$ such that the string in Fourier space is one dimensional in terms of k_ρ and is represented by

$$\sum_{s=1}^{S} \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho 0}} e^{-\frac{1}{2}\left(v_{s\rho 0} \frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j \frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}} (v_{s\rho 0} k_\rho)} e^{-jk_\rho \rho_{fb_{s,m}}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right) \frac{N_{s,m_{\rho 0}} \rho_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho_0}$ is a constant such as the signal propagation velocity in the ρ direction, $\frac{\sqrt{N_{s\rho_0}}}{\alpha_{s\rho_0}}$ is a delay parameter and $\alpha_{s\rho_0}$ is a half-width parameter of a corresponding Gaussian filter in the k_ρ-space, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{fb_{s,m}}$ is a constant such as the signal propagation velocity, $a_{0_{s,m}}$ is a constant, k_ρ is the frequency variable, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$ and $\rho_{0_{s,m}}$ are data parameters.

253. (Previously Presented) A computer-readable medium to claim 252, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

254. (Previously Presented) A computer-readable medium to claim 252, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

255. (Previously Presented) A computer-readable medium to claim 252, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

256. (Previously Presented) A computer-readable medium to claim 237, wherein the probability expectation value is based upon Poissonian probability.

257. (Previously Presented) A computer-readable medium to claim 256, wherein the probability expectation value is characterized by

$$\prod_s \left[p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right) \exp\left[-\beta_s^{-2}\left(\frac{1-\cos 2\phi_s}{2}\right)\right] \cos(\delta_s + 2\sin\phi_s) \right]$$

wherein P is the maximum probability that at least one other Fourier series is active given that a first Fourier series is active, $p_{\uparrow_s}$ is a probability of a Fourier series

becoming active in the absence of coupling from at least one other active Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor.

258. (Previously Presented) A computer-readable medium to claim 257, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$

$$\exp - \left\{ \frac{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)^2}{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

259. (Previously Presented) A computer-readable medium to claim 258, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

260. (Previously Presented) A computer-readable medium to claim 258, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

261. (Previously Presented) A computer-readable medium to claim 258, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

262. (Previously Presented) A computer-readable medium to claim 258, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fb m_1}}{v_{fb m_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fb m_s}}{v_{fb m_s}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fb m_1}}{v_{fb m_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb m_1} = v_{fb m_1} t_{fb m_1}$ and $\rho_{fb m_s} = v_{fb m_s} t_{fb m_s}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb m_1}$ and $t_{fb m_s}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb m_1}$, and $v_{fb m_s}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

263. (Previously Presented) A computer-readable medium to claim 262, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the

data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

264. (Previously Presented) A computer-readable medium to claim 262, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

265. (Previously Presented) A computer-readable medium to claim 262, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

266. (Previously Presented) A computer-readable medium on which is stored a computer program for providing (Previously Presented) A method for recognizing a pattern in information and establishing an order formatted pattern in information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) recording ordered strings comprising Fourier series to a high level memory, said Fourier series representing information;

b.) forming association between Fourier series of the ordered strings to form complex strings and recognizing a pattern in information;

c.) ordering the Fourier series of the complex strings to form complex ordered strings representing recognized information and establishing an order formatted pattern in information, and

d.) storing the complex ordered strings to the high level memory.

267. (Previously Presented) A computer-readable medium on which is stored a computer program for providing (Previously Presented) A method for recognizing a pattern in information comprising data and forming a predominant configuration, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on an activation rate of the corresponding component;

b.) storing the activation probability parameter in memory;

c.) generating a probability operand based on the activation probability parameter;

d.) if said probability operand is a desired value, activating any component of one or more of the group consisting of an input layer, an association layer, a string ordering layer, and a predominant configuration layer, the activation being based on the activation probability parameter, wherein recognition of a pattern in information is achieved when said probability operand is said desired value, and

e.) repeating steps a-d to form a predominate configuration.

268. (Previously Presented) A method according to claim 267, wherein said probability operand having a value selected from a set of zero and one.

269. (Previously Presented) A method according to claim 268, wherein said desired value is one.

270. (Previously Presented) A computer program product for recognizing a pattern in information for use in a computer including a central processing unit and a memory, the memory maintaining a set of initial ordered Fourier series, the computer program product comprising:

a computer readable medium;

program code means embodied in the computer readable medium, the program code means comprising:

means for receiving data representative of physical characteristics or representations of physical characteristics within an input context of the physical characteristics and transforming the data into a Fourier series in Fourier space wherein the input context is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies;

means for receiving a plurality of the Fourier series in Fourier space including at least one ordered Fourier series from the memory, forming a string comprising a sum of the Fourier series and storing the string in memory;

means for retrieving the string from memory, ordering the Fourier series contained in the string to form an ordered string and storing the ordered string in memory; and

means for retrieving multiple ordered strings from the memory, forming complex ordered strings from the ordered strings and storing the complex ordered strings to the memory.

271. (Previously Presented) A method of recognizing a pattern in information comprising data and establishing an order formatted pattern in information, the method comprising:

encoding inputted data as a plurality of Fourier components in Fourier Space and form a plurality of Fourier series from said Fourier components, said Foureir series representing information comprising data and input context;

associating said plurality of Fourier series with each other according to spectral similarities between said plurality of Fourier series to form a string, said string being a sum of associated plurality of Fourier series;

ordering said plurality of Fourier series within said string based on relative degree of association of order formatted subsets of said string with relevant aspects of a standard ordered string;

assigning an activation probability parameter to each of said plurality of Fourier components and to each of said plurality of Fourier series to produce a predominant configuration string, generating a probability operand based on said activation probability parameter, said probability operand determining whether an activation of any one of said plurality of Fourier component and said plurality of Fourier series is to cause an activation of an associated another of said plurality of Fourier components and said plurality of Fourier series from said ordered string; and

storing said predominant configuration string in a memory, thereby a pattern in newly inputted information can be recognized.

272. (Previously Presented) A method according to claim 271, wherein said step of associating said plurality of Fourier series comprises sampling and modulating at least one of said plurality of Fourier series with at least one filter.

273. (Previously Presented) A method according to claim 272, wherein said at least one filter comprises a time delayed Gaussian filter in time domain.

274. (Previously Presented) A method according to claim 271, wherein said step of ordering said plurality of Fourier series comprises sampling and modulating at least two of said plurality of Fourier series with at least two filters from a set of filters.

275. (Previously Presented) A method according to claim 274, wherein said at least two filters comprises a time delayed Gaussian filter in time domain.

276. (Previously Presented) A method according to claim 271, wherein said step of associating ones of said plurality of Fourier series comprises coupling said plurality of Fourier series based on a probability distribution.

277. (Previously Presented) A method according to claim 271, wherein said probability distribution is a Poissonian distribution.

278. (Previously Presented) A method according to claim 271, wherein said coupling is based on a spectral similarity of said plurality of Fourier series.

279. (Previously Presented) A method according to claim 271, wherein said probability operand is selected from the group of one and zero.

280. (Previously Presented) A method according to claim 279, wherein said desired value is one.

281. (Previously Presented) A system for recognizing a pattern in information comprising data, the method comprising:

an input layer operable to receive said data, and to encode said received data as parameters of a plurality of Fourier series in Fourier space, said plurality of Fourier series including input context of said data;

a memory comprising a set of initial ordered Fourier series;

an association layer operable to add associated Fourier series together to form a string;

an ordering layer operable to order said string based on relative degree of association of order formatted subsets of said string with relevant aspects of characteristics with respect to at least one of said initial ordered Fourier series to form an ordered string;

a predominant configuration layer for receiving said ordered string and for assigning an activation probability parameter to each of said plurality of Fourier series to produce a predominant configuration string, generating a probability operand based on said activation probability parameter, said probability operand determining whether an activation of any one of said plurality of Fourier components and said plurality of Fourier series is to cause an activation of an associated another one of said plurality of Fourier components or Fourier series; and

a memory adapted to store said predominant configuration string, said predominant configuration string allowing a determination of a relative association of a newly inputted information to said inputted information already processed, thereby recognition of a pattern in said information can be recognized.

282. (Previously Presented) A system according to claim 281, wherein said association layer is operable to associate Fourier series based on a spectral similarity between one another.

283. (Previously Presented) A system according to claim 281, wherein said probability operand is determined based on a historical value of said activation probability parameter and an activation rate of respective Fourier series.

284. (Previously Presented) A system according to claim 281, wherein said information context is encoded in time as delays corresponding to modulation of each Fourier component and Fourier series at corresponding frequencies.

285. (Previously Presented) A method of recognizing a pattern in information comprising data, the method comprising:

providing an input layer operable to receive data;

providing an association layer operable to add associated portions of said data together to form a string;

providing an ordering layer operable to order said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered string;

providing a predominant configuration layer operable to receive a plurality of ordered strings to form a complex ordered string therefrom;

assigning an activation probability parameter to each of said input layer, said association layer, said ordering layer and said predominant configuration layer, said activation probability parameter being determined based on a historical value of said activation probability parameter and an activation rate of respective ones of said input layer, said association layer, said ordering layer and said predominant configuration layer;

generating a probability operand based on the activation probability parameter; and

activating one or more of said input layer, said association layer, said ordering layer, said predominant configuration, said ordering layer, said predominant configuration layer, and said association layer if said probability

operand has a desired value, whereby a pattern in said information is recognized according to a historical associative pattern in said data.

286. (Previously Presented) A method according to claim 285, wherein said step of providing an ordering layer comprises ordering said string according to a plurality of associations between the information of the plurality of order formatted subset Fourier series and at least one ordered Fourier series from a high level memory.

287. (Previously Presented) A method according to claim 285, wherein said step of providing an input layer comprises providing an input layer operable to encode said received data as parameters of a plurality of Fourier series in Fourier space.

288. (Previously Presented) A method according to claim 285, wherein said step of providing an association layer comprises providing said association layer to associate Fourier series based on a spectral similarity between one another.

289. (Previously Presented) A method according to claim 285, wherein said probability operand has a binary value of one and zero, and said desired value is one.

290. (Previously Presented) A computer readable medium having stored thereon a computer program to implement a method of recognizing a pattern in information comprising data, said computer program comprising a plurality of codes for executing the steps of:

encoding said data as parameters of a plurality of Fourier components in Fourier space;

adding said plurality of Fourier components together to form a plurality of Fourier series in Fourier space, said plurality of Fourier series representing inputted information;

sampling at least one of said plurality of Fourier series in Fourier space with a filter to form a sampled Fourier series;

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

determining a spectral similarity between said modulated Fourier series and another one of said plurality of Fourier series;

determining a probability expectation value based on said spectral similarity;

generating a probability operand based on said probability expectation value; and

adding said modulated Fourier series and said another Fourier series, if said probability operand has a desired value, to form a string of Fourier series in Fourier space, said string representing an association between Fourier series to thereby allow recognition of a pattern in the information.

291. (Previously Presented) A computer-readable medium according to claim 290, further comprising storing said string of Fourier series to a memory.

292. (Previously Presented) A computer-readable medium according to claim 290, wherein said probability operand has a value selected from the set of one and zero.

293. (Previously Presented) A computer-readable medium according to claim 292, wherein said desired value is one.

294. (Previously Presented) A method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the method comprising:

a.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

b.) selecting at least two filters from a selected set of filters;

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

h.) determining a probability expectation value based on the spectral similarity;

i.) generating a probability operand based on the probability expectation value;

j.) repeating steps b-i until the probability operand has a desired value, when said probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

k.) storing the summed Fourier series to an intermediate memory;

l.) removing the selected filters from the selected set of filters to form an updated set of filters;

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability operand has a desired value a pattern in information has been recognized and an order information pattern in the information has been established;

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

aa.) storing the Fourier series in the intermediate memory in the high level memory, said updated summed Fourier series representing said plurality of Fourier series in said strings ordered according to a plurality of associations between the information of the plurality of order formatted subset Fourier series and the at least one ordered Fourier series from high level memory.

295. (Previously Presented) A method according to claim 294, wherein information is represented by a sum of Fourier series in Fourier space.

296. (Previously Presented) A method according to claim 294, further comprising encoding data which includes modulating at least one of said Fourier components to provide an input context.

297. (Previously Presented) A method according to claim 294, wherein inputted information comprises data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

298. (Previously Presented) A method according to claim 294, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

299. (Previously Presented) A computer readable medium having stored thereon a computer program to implement a method of recognizing a pattern in information comprising data and establishing an order formatted pattern in the information, said computer program comprising a plurality of codes for executing the steps of:

providing an input layer operable to receive data;

providing an association layer operable to add associated portions of said data together to form a string;

providing an ordering layer operable to order said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered;

providing a predominant configuration layer operable to receive a plurality of ordered strings to form a complex ordered string therefrom;

assigning an activation probability parameter to each of said input layer, said association layer, said ordering layer and said predominant configuration layer, said activation probability parameter being determined based on a historical value of said activation probability parameter and an activation rate of respective ones of said input layer, said association layer, said ordering layer and said predominant configuration layer;

generating a probability operand based on the activation probability parameter; and

activating one or more of said input layer, said association layer, said ordering layer, said predominant configuration, said ordering layer, said predominant configuration layer, and said association layer if said probability operand has a desired value, whereby a pattern in said information is recognized according to a historical associative pattern in said data.

300. A computer readable medium according to claim 299, wherein said input layer is operable to encode said received data as parameters of a plurality of Fourier series in Fourier space.

301. (Previously Presented) A computer readable medium according to claim 299, wherein said association layer is operable to associate ones of said plurality of Fourier series based on a spectral similarity between one another.

302. (Previously Presented) A computer readable medium according to claim 299, wherein said probability operand has a binary value of one or zero

303. (Previously Presented) A computer readable medium according to claim 302, wherein said desired value is one.

304. (Previously Presented) A computer program product for use in a system for recognizing a pattern in information comprising data, said computer program product comprising:

a computer readable medium having stored thereon program code means, said program code means comprising:

means for receiving data, and to encode said received data as parameters of a plurality of Fourier series in Fourier space, said plurality of Fourier series including input context of said data;

means for associating Fourier series together to form a string;

means for ordering said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered string; and

means for forming a complex ordered string from a plurality of ordered strings, said complex ordered string representing a historical association and order of processed and stored information to thereby allow recognition of a pattern in information.

305. (Previously Presented) A computer program according to claim 304, further comprising storing said complex ordered string in high level memory.

306. (Previously Presented) A computer program product according to claim 305, wherein said means for associating is operable to associate ones of said plurality of Fourier series based on a spectral similarity between one another.

307. (Previously Presented) A data structure in a memory for access by a computer program for processing information, said data structure allowing an efficient recognition of a pattern in newly presented information comprising data and input context representing characteristic in relational association with information stored in said memory, said data structure comprising:

a plurality of transduced data objects, each of said plurality of transduced data objects providing an input data object representative of characteristics received from a transducer acting on a signal provided by the characteristics encoded as a Fourier series in Fourier space;

a plurality of memory data objects stored in memory registers corresponding to the input data objects;

a plurality of association data objects, each of said plurality of association data objects being a sum of associated ones of said plurality of memory data objects or transduced data objects;

a plurality of order formatted data objects, each of said plurality of order formatted data objects being one of said plurality of association data objects arranged in a hierarchically order of relative degree of association of relevant aspects of said information with respect to a standard plurality of association data objects;

a plurality of activation probability objects, each of said plurality of activation probability objects being assigned to respective one of said plurality of transduced data objects, input data objects, memory data objects, said plurality of association data objects and said plurality of order formatted data objects;

a plurality of probability operands being assigned to respective plurality of transduced data objects, input data objects, memory data objects,

said plurality of association data objects and said plurality of order formatted data objects, each based on said activation probability objects;

wherein each of said plurality of transduced data objects, said input data objects, said memory data objects, said plurality of association data objects and said plurality of order formatted data objects is activated when one of said plurality of probability operands has a desired value; and

wherein a value of each of said plurality of activation probability objects being determined based on historical values and frequency of activation of said respective one of said plurality of transduced data objects, input data objects, memory data objects, said plurality of association data objects and said plurality of order formatted data objects to thereby allow recognition of characteristics of said newly presented information based on historical relational and associational pattern in said information stored in said memory.

308. (Previously Presented) A data structure according to claim 307, wherein the transduced data objects correspond to the input data objects which further correspond to the memory data objects such that context of the characteristics is encoded.

309. (Previously Presented) A data structure according to claim 308, wherein the organization of the memory data objects of memory corresponds to and represents the context of the input data objects which further corresponds to and represents the transduced data objects which further corresponds to and represents the context of the characteristics.

310. (Previously Presented) A data structure according to claim 307, wherein the transducer has n levels of subcomponents and is assigned a master memory register with n + 1 sub registers in a heirarchical manner that parallels and corresponds to the n levels of the transducer subcomponents wherein the stream of transduced data objects from the n th level transducer sub component provides said plurality of input data objects that are stored as

memory data objects as a function of time in the n+1 sub register wherein the identity of the memory register encodes the input context which represents the context of the characteristics according to the specific transducer or transducer subcomponent.

311. (Previously Presented) A data structure according to claim 307, wherein the transducer has n levels of subcomponents and is assigned a master memory pointer with n + 1 sub pointers in a heirarchical manner that parallels and corresponds to the n levels of the transducer subcomponents wherein the stream of transduced data objects from the n th level transducer sub component provides said plurality of input data objects that are stored as memory data objects as a function of time in the n+1 sub pointer wherein the identity of the memory pointer encodes the input context which represents the context of the characteristics according to the specific transducer or transducer subcomponent.

312. (Previously Presented) A data structure according to claim 307, further comprising a predominant configuration data object being a sum of associated ones of said plurality of order formatted data objects.

313. (Previously Presented) A data structure in a memory for access by a computer program for efficient recognition of a pattern in information comprising data stored in the memory, the data structure comprising:

a plurality of transduced data objects, each of said plurality of transduced data objects providing an input data object representative of characteristics received from a respective one of a plurality of transducers acting on a signal provided by characteristics encoded as a Fourier series in Fourier space, wherein said input data objects allows associations among and relational pattern of said input data objects by spectral analysis to achieve recognition of a pattern in information, while preserving input context of said input signal including an identity of said respective one of said plurality of transducers.

314. (Previously Presented) A data structure according to claim 313, further comprising a plurality of association data objects, each of said plurality of association data objects being a sum of associated ones of said plurality of input data objects.

315. (Previously Presented) A data structure according to claim 314, further comprising a plurality of order formatted data objects, each of said plurality of order formatted data objects being one of said plurality of association data objects arranged in a hierarchically order of relative degree of association with relevant characteristics of said information with respect to a standard plurality of order formatted data objects.

316. (Previously Presented) A data structure according to claim 313, further comprising a predominant configuration data object being a sum of associated ones of said plurality of order formatted data objects.

317. (Previously Presented) A data structure according to claim 316, further comprising a plurality of activation probability objects, each of said plurality of activation probability objects being assigned to respective said plurality of transduced objects, said plurality of memory data objects, said plurality of input data objects, said plurality of association data objects, said plurality of order formatted data objects and said predominant configuration data object.

318. (Previously Presented) A data structure according to claim 314, further comprising a plurality of activation probability operands based on activation probability parameters, each of said plurality of activation probability operands being assigned to respective said plurality of transduced objects, said plurality of memory data objects, said plurality of input data objects, said plurality of association data objects, said plurality of order formatted data objects and said predominant configuration data object.

319. (Previously Presented) A data structure according to claim 318, wherein said activation probability parameter of each object is based on at least one of historical activation probability parameter or an activation frequency.

320. (Previously Presented) A data structure according to claim 318, wherein an object is activated when said probability operand has a desired value.

321. (Previously Presented) A data structure according to claim 320, wherein said probability operand has a value selected from the set of one and zero.

322. (Previously Presented) A data structure according to claim 321, wherein said desired value is one.

(ix) Evidence Appendix

Not applicable.

(x) Related Proceedings Appendix

The U.S. Patent and Trademark Board of Appeal's previous Decision in the present application mailed March 22, 2005

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 36

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RANDELL L. MILLS

Appeal No. 2004-0883
Application No. 09/220,970

HEARD: JANUARY 25, 2005

Before THOMAS, FLEMING, and LEVY, ***Administrative Patent Judges***.

LEVY, ***Administrative Patent Judge***.

REMAND TO THE EXAMINER

We remand this application to the examiner for consideration of the following matters; see 37 CFR § 41.50(a)(1). This application is on appeal under 35 U.S.C. § 134 from the examiner's rejection[1] of claims 51-66, 69-95, 98-176, 181-205, 208-231, 233-276 and 278-322. Claims 1-50 have been canceled. Claims 67, 68, 96, 97, 177-180, 206, 207, 232 and 277 have been objected to by the examiner. In the non-final Office action (Paper No. 17, mailed July 19, 2001) mailed just prior to the filing of this appeal, the

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[1] Although the claims have not been finally rejected, they have been rejected twice; see 35 U.S.C. § 134.

examiner (pages 6-30) set forth the following rejections of the claims:

I. Claims 61-64, 71-76, 98-113, 123-155, 171-174, 181-196, 208-233, 233-265, 294-298, and 307-322 stand rejected under 35 U.S.C. § 112(2) as being indefinite and/or incomplete.

ii. Claims 127-155, 237-265, 294-298 and 307-322 stand rejected under 35 U.S.C. § 101 as being drawn to non-statutory subject matter.

iii. Claims 157, 266 and 267 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Kortge.

iv. Claims 271, 272, 274, 276, 278, 281-283, 285-288, 290, 291, 299-301, 304-309 and 312-320 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Caid.

v. Claims 158, 159, 268 and 269 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kortge in view of Streit.

vi. Claims 279, 280, 289, 292, 293, 302, 303, 321 and 322 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Caid in view of Streit.

vii. Claims 156, 270, 273, 275 and 284 under 35 U.S.C. § 103(a) as being unpatentable over Caid in view of Dickhaus.

viii. Claims 51-54, 57-60 and 118-120 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenspan.

ix. Claims 55, 87-90, 114, 117, 160-165, 167-170, 197-200, 224 and 227-230 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenspan in view of Kortge.

x. Claim 56 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenspan in view of Strait.

xi. Claims 115, 116, 166, 225 and 226 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenspan in view of Kortge and Streit.

xii. Claims 65, 66, 69, 70, 91, 94, 95 and 121 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenspan in view of Dickhaus.

xiii. Claims 175, 176, 201, 203-205 and 231 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenspan in view of Kortge and Dickhaus.

xiv. Claims 92 and 93 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenspan in view of Dickhaus and Levien.

xv. Claim 202 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenspan in view of Kortge, Dickhaus and Levien.

In the examiner's answer (page 8), the examiner withdrew all but the following rejections (answer, pages 8-16):

1. Claims 307-322 stand rejected under 35 U.S.C. § 101 as being drawn to non-statutory subject matter.

2. Claims 157 and 267 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Kortge.

3. Claims 271, 272, 274, 276, 278, 281-283, 285-288, 290, 291, 299-301, 304-309 and 312-320 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Caid.

4. Claims 158, 159, 268 and 269 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kortge in view of Streit.

5. Claims 279, 280, 289, 292, 293, 302, 303, 321 and 322 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Caid in view of Streit.

6. Claims 156, 270, 273, 275 and 284 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Caid in view of Dickhaus.

Accordingly, only claims 156-159, 267-276, 278-293, and 299-322 remain before us for decision on appeal.

From our review of the record, we find that the application is not in condition for decision on appeal. For example, in the

rejection of claims 271, 272, 274, 276, 278, 281-283, 285-288, 290, 291, 299-301, 3-4-309 and 312-320 under 35 U.S.C. § 102(e) as being unpatentable over Caid, the examiner, in rejecting these 32 claims, provides a discussion of Caid without specific reference to any particular claim, and then provides a specific discussion for only claim 304.

From our review of the general discussion provided by the examiner, we do not find a direct one-to-one correspondence between the disclosure of Caid and the specific limitations of the claims. Although the examiner refers to portions of the Caid reference, the examiner does not explain how the portions of the reference relied upon meet all of limitations of the specific claims. As an example, although the examiner (answer, page 10) refers to the use of a "Fourier Series in Fourier Space" in Caid (column 5, lines 1-16 and col. 5, line 61 to column 6, line 14), we find no disclosure of this in Caid, notwithstanding the examiner's assertion to the contrary. It appears that the examiner has not considering the term "Fourier Series in Fourier Space," but rather simply looked for a disclosure of a Fourier Series. Because only 1 claim out of 32 claims in the rejection are referred to by number, and we are unable to determine from the reference how Caid

anticipates the claims, we are unable to determine how the examiner considers the limitations of each of the claims to be anticipated.

Thus, as it is unclear from the examiner's answer exactly how the examiner considers the claims to be anticipated by Caid, the application is not in condition for decision on appeal.

However, from our review of the record, we find that the application can best be disposed of in the following manner:

Appellant bases patentability, inter alia, on the definitions of terms "Fourier Series in Fourier Space" and "Probability Operand" that appellant has "coined." From our review of the detailed specification, we were unable to locate a specific definition of these terms with reasonable clarity, deliberativeness, and precision.

As our reviewing court states, "[T]he terms used in the claims bear a "heavy presumption" that they mean what they say and have the ordinary meaning that would be attributed to those words by persons skilled in the relevant art." Texas Digital Systems, Inc. v. Telegenix, Inc., 308 F.3d 1193, 1202, 64 USPQ2d 1812, 1817 (Fed. Cir. 2002). Moreover, when interpreting a claim, words of the claim are generally given their ordinary and accustomed meaning, unless it appears from the specification or the file history that

they were used differently by the inventor. Carroll Touch, Inc. v. Electro Mechanical Sys., Inc. 15 F.3d 1573, 1577, 27 USPQ2d 1836, 1840 (Fed. Cir. 1993). Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision. In re Paulsen, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994).

In analyzing claims, we begin with the language of the claims. We then look to the specification for an understanding of these terms in the context in which they are used. If the terms are not specifically defined, we look to a technical dictionary, if possible, to ascertain how an artisan would understand the terms. As appellant has coined the phrases "Fourier Series in Fourier Space" and "Probability Operand," we need not look for a dictionary definition of these terms. We add that in prosecution before the PTO, claims are interpreted differently than by the courts, in that we give the claims their "broadest reasonable interpretation," and do not read limitations into the claim that are not found therein; see In re Morris, 127 F. 3d1048, 1054-1055(Fed. Cir. 1997).

Because a substantive issue on appeal is whether the applied prior art contains the claimed "Fourier Series in Fourier

Space" and "Probability Operand," at the Oral Hearing, the Panel made a Request For Information under 37 CFR § 1.105(a)(1) and 37 CFR § 41.50(c)(effective September 13, 2004); see also former rule 37 CFR 1. 196(d). Specifically, the panel requested that appellant either (a) point to the definitions for the terms "Fourier Series in Fourier Space" and "Probability Operand" in the specification, or (b) provide specific definitions of these terms, and (c) if definitions were provided, to point to the language in the specification that supports the definition in the specification as originally filed. In a Communication filed, via facsimile, on January 27, 2005, appellant responded to the Request For Information, with a paper providing explicit definitions for the terms "Fourier Series in Fourier Space" and "Probability Operand," and additionally pointed out the portions of the specification, as originally filed, that support these definitions. The definitions provided define "Fourier Series in Fourier Space" as "**[a] Fourier series in Fourier space is a sum of trigonometric functions in frequency space where each variable is frequency and the parameters of the Fourier series are input data or processed input data.**" In addition, the definition provided for "Probability Operand" is "**[a] probability operand is a system that returns a binary number in**

response to a probability-expectation-value or activation-probability-parameter input according to a specific statistic. The value of the operand causes a specific action, such as adding Fourier series to form a string, storing a summed Fourier series to memory, or activating a component of the system." From our review of the information provided, we find that although it did not appear, at first blush, that the terms "Fourier Series in Fourier Space" and "Probability Operand," were described in the specidfication as filed, we are convinced that there is adequate basis for these terms in the originally filed specification.

From the specific definitions provided, we find that the claims rejected over prior art distinguish over the applied prior art, for the reasons set forth by appellant in the briefs. However, the Communication filed by appellant is not an amendment, and is not part of the specification. However, if put into an amendment, the proffered definitions would not introduce new matter into the specification.

37 CFR § 41.50(c) sets forth that:

> The opinion of the Board may include an explicit statement of how a claim on appeal may be amended to overcome a specific rejection. When the opinion of the Board includes such a statement, appellant has the right to amend in conformity therewith. An amendment in

> conformity with such statement will overcome the specific rejection. An examiner may reject a claim so-amended, provided that the rejection constitutes a new ground of rejection.

Although the amendment will be directed to the specification and not to the claims, the definitions are evidence which relate to the claims, and therefore will result in an amendment that changes the scope of the claims and distinguishes the claims from the applied prior art. In view of our finding that the amendment will provide specific definitions for terms in the claims, we remand the application to the examiner to allow appellant to file an amendment consistent and coextensive with the Communication submitted to us on January 27, 2005, providing specific definitions for the terms "Fourier Series in Fourier Space" and "Probability Operand."

Our reason being that the definitions will limit the claims to the definitions of the terms provided, as well as to distinguish the claims over the applied prior art.

We observe that terms "Fourier Series in Fourier Space" and/or "Probability Operand" appear in each of the independent claims on appeal. Should the examiner decide to reapply the same prior art, or different prior art to the claims, the examiner is expected to provide a one-to-one correspondence between the language in the

claims and the disclosure of the references, which the examiner has not done in the present answer before us. Moreover, the Examiner must set forth a prima facie case. It is the burden of the Examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the reasonable teachings or suggestions found in the prior art, or by a reasonable inference to the artisan contained in such teachings or suggestions. *See* In re Sernaker, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983). In addition, should the examiner decide to reapply the same or different prior art against the claims in response to this remand, we request that the examiner additionally treat each rejected claim separately.

Additionally, as to claims 307-322, rejected under 35 U.S.C. § 101 as being drawn to non-statutory subject matter, if the examiner intends to repeat the rejection, the examiner should point out how the examiner considers independent claims 307 and 313 to be data structures, per se, in view of the limitations "A data structure in a memory . . . with information stored in said memory . . . a plurality of memory data objects . . . to thereby allow recognition of characteristics of said newly presented information

. . . in said information stored in said memory" of claim 307, and "A data structure in memory . . . comprising data stored in the memory . . . to achieve recognition of a pattern in information" as recited in claim 313.

In view of the above discussion, we remand this application to the examiner for consideration of the above-noted matters and entry of an amendment (to be filed) containing definitions for the terms "Fourier Series in Fourier Space" and "Probability Operand."

This application, by virtue of its "special" status, requires immediate action by the examiner. *See* MPEP § 708.01(d). The Board of Patent Appeals and Interferences must be informed promptly of any action affecting the appeal in this case, including reopening of prosecution, allowance and/or abandonment of the application.

MANELLI, DENISON & SELTER
2000 M STREET, N.W.
SUITE 700
WASHINGTON, DC 20036-3307

(xi) CONTINUATION OF CONCISE EXPLANATION OF INVENTION

51. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method for recognizing a pattern in information comprising data, the method comprising:

inputting data;

(Fig. 2, "Data", described at page 8, line 20)

encoding data as parameters of a plurality of Fourier components in Fourier space;

(Fig. 2, processor (22), described at page 8 lines 21-22)

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

(Fig. 2 described at page 13 lines 4-6)

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

(Fig. 2, filter 34, described at page 13 lines 7-10)

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

(Fig. 2, filter 34, described at page 13 lines 7-10)

determining a spectral similarity between said modulated Fourier series and another Fourier series;

(Fig. 2, spectral similarity analyzer 36, described at page 13 lines 10-15)

determining a probability expectation value based on said spectral similarity;

(Fig. 2, probability expectation analyzer 38, described at page 13 lines 14-17)

generating a probability operand based on said probability expectation value;

(Fig. 2, probability operand generator 40, described at page 13 lines 17-20)

selecting a desired value for said probability operand, wherein recognition of a pattern in information is obtained when said probability operand having said desired value; and

(Fig. 2, described on page 13, lines 20-26, in this disclosed example, the desired probability operand value was selected to be one, but can be any value desired by the user)

outputting a recognized pattern.

(Fig. 2, described on page 13, lines 20-26, when the desired probability operand value is a desired value, a pattern is recognized and can be outputted as recognized. In the particular disclosed example on page 13, the recognized pattern is outputted in a manner such that the Fourier series is combined with said another Fourier series to a provide string of recognized information represented by the Fourier series (which is recited in dependent claim 52). The recognized string can be increased in size as desired by repeating the steps of the method. Recognition is also referred to as "association" or "associated information" in the application.)

52. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, further comprising adding said modulated Fourier series and said another Fourier series to form a string of Fourier series in Fourier space when said probability operand has said desired value.

53. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 52, further comprising storing said string of Fourier series to a memory.

54. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein said another Fourier series represents known information.

55. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein said steps of adding said plurality of Fourier components together, sampling at least one of said plurality of Fourier series in Fourier space, modulating said sampled Fourier series in Fourier space, determining a spectral similarity between said modulated Fourier series and another one

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}\frac{4}{\rho_{0_m}z_{0_m}}a_{0_m}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

62. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 61, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to a rate of change of said physical characteristics, and each of ρ_{0_m} and z_{0_m} is inversely proportional to an amplitude of said physical characteristics.

63. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 61, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to said amplitude of said physical characteristics, and each of ρ_{0_m} and z_{0_m} is inversely proportional to said rate of change of said physical characteristics.

64. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 61, wherein each of $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ is proportional to a duration of a signal response of at least one input transducer; and each of ρ_{0_m} and z_{0_m} is inversely proportional to said physical characteristics.

65. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 57, wherein step of encoding said data further comprises encoding said input context as a characteristic time delay which corresponds to a characteristic modulation of said Fourier components or Fourier series at a frequency within a band.

66. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 65, wherein said characteristic modulation frequency band represents said input context according to at least one of a transducer, specific transducer element, and fundamental relationships including a physical context, a temporal order, a cause and effect relationship including a temporal order, a size order, an intensity order, a before-and-after order, a top-and-bottom order, and a left-and-right order.

67. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 66, wherein said transducer has *n* levels of subcomponents, and is assigned a master time interval with $n+1$ sub time intervals in a hierarchical manner corresponding to said *n* levels of the transducer subcomponents, and wherein a data stream from a n^{th} level subcomponent of said transducer is recorded as a function of time in the $n+1$ sub time intervals, each of said $n+1$ time intervals representing a time delay that corresponds to said characteristic modulation frequency band representing said input context.

68. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 67, wherein the input context is based on the identity of the specific transducer and transducer subcomponents.

69. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 65, wherein the characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$ which corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay.

70. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 69, wherein the step of adding at least two Fourier components together further comprises storing the characteristic modulation frequency in a distinct memory location within the band encoded as a delay in time.

75. *(page 16, line 16 to page 21, line 8)* A method according to claim 69, wherein the string has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ is selected from one of:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$

$$\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

and

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}\frac{4}{\rho_{0_{s,m}}z_{0_{s,m}}}e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$

$$\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $\rho_{t_{s,m}}=v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}}=v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

76. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 75, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

77. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 75, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

78. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 75, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

79. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein the Fourier series in Fourier space, has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ and is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}\frac{4}{\rho_{0_m}z_{0_m}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

80. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 79, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

81. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 79, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

82. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 79, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

83. *(page 16, line 16 to page 21, line 8)* A method according to claim 79, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}}=v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}}=v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

84. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 83, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

85. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 83, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

86. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 83, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

87. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein the step of adding at least two of said Fourier components together further comprises creating transducer strings by obtaining a Fourier series from at least two selected transducers and adding the Fourier series.

88. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 87, further comprises selecting transducers that are active simultaneously.

89. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 88, wherein the transducer string is stored in a distinct memory location wherein a characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$ which corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay.

90. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 89, wherein the step of adding at least two of said Fourier components together further comprises recalling any part of the transducer string from the distinct memory location which thereby causes additional Fourier series of the transducer string to be recalled.

91. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein the filter is a time delayed Gaussian filter in the time domain.

92. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 91, wherein the Gaussian filter comprises a plurality of cascaded stages each stage having a decaying exponential system function between stages.

93. *(page 64, lines 33-36)* A method according to claim 92, wherein the Gaussian filter is modulated in the time domain to produce a frequency shift of the sampling and modulation in the frequency domain.

94. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 91, wherein the filter is characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}}e^{\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ is a delay parameter, α is a half-width parameter, and t is the time parameter.

95. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 94, wherein the filter, in frequency space, is characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2}e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter.

96. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein the probability expectation value is based upon Poissonian probability.

97. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 96, wherein the probability expectation value is characterized by

$$\prod_s\left[p_{\uparrow_s}+\left(P-p_{\uparrow_s}\right)\exp\left[-\beta_s^{-2}\left(\frac{1-\cos 2\phi_s}{2}\right)\right]\cos\left(\delta_s+2\sin\phi_s\right)\right]$$

wherein P is the maximum probability of at least one other Fourier series being associated with a first Fourier series, $p_{\uparrow_s}$ is a probability of at least one other Fourier

series being associated with a first Fourier series in the absence of coupling of the first Fourier series with the at least one other Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor.

98. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 97, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}}$$

$$\sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s} \exp-\left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \frac{N_{m_1} \rho_{0_{m_1}}}{2v_{m_1}} - \frac{N_{m_s} \rho_{0_{m_s}}}{2v_{m_s}} \right)^2}{2} \right\}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

99. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 98, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

100. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 98, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

101. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 98, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

102. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 97, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} - \sum_{m_s=1}^{M_s} \frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

103. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 102, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

104. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 102, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

105. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 102, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each

physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

109. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 106, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

110. (*page 16, line 16 to page 21, line 8)* A method according to claim 97, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m1}}}{2v_{m_1}} + \frac{\rho_{fbm_1}}{v_{fbm_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fbm_s}}{v_{fbm_s}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m1}}}{2v_{m_1}} + \frac{\rho_{fbm_1}}{v_{fbm_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fbm_1} = v_{fbm_1} t_{fbm_1}$ and $\rho_{fbm_s} = v_{fbm_s} t_{fbm_s}$ are the modulation factors which corresponds to the specific transducer time delay t_{fbm_1} and t_{fbm_s}, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, v_{fbm_1}, and v_{fbm_s} are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

111. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 110, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each

Fourier component is inversely proportional to the amplitude of the physical characteristic.

112. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 110, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

113. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 110, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

114. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, further comprising linking at least two Fourier series stored in a memory comprising the steps of

a.) generating a probability expectation value that recalling any part of one of the Fourier series from the memory causes at least another Fourier series to be recalled from the memory;

b.) storing the probability expectation value to memory;

c.) generating a probability operand based on the probability expectation value, and

d.) recalling the at least another Fourier series from the memory if the operand has a desired value.

115. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 114, wherein said probability operand is a value selected from a set of zero and one value selected from a set of zero and one.

116. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 115, wherein said desired value is one.

transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

106. *(page 16, line 16 to page 21, line 8)* A method according to claim 97, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$

$$\exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}} \right) - \left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}} \right) \right)^2}{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

107. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 106, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

108. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 106, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the

REMAND TO THE EXAMINER

JAMES D. THOMAS Administrative Patent Judge	)	
MICHAEL R. FLEMING Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
STUART S. LEVY Administrative Patent Judge	)	

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of said plurality of Fourier series, determining a probability expectation value, and generating a probability operand are repeated until a said probability operand has said desired value.

56. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein said value of said probability operand is selected from a set of zero and one; and wherein said desired value is one.

57. *(page 7, lines 14-16; page 10, line 34 to page 11, line 3; page 10, line 34 to page 12, line 2)* A method according to claim 51, wherein said step of encoding data further comprises modulating at least one of said Fourier components to provide an input context.

58. *(page 6, line 25 to page 7, line 10)* A method according to claim 57, wherein inputted information comprises said data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

59. *(page 8, lines 19-29)* A method according to claim 51, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

60. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein said step of adding at least two Fourier components together is conducted to provide at least two Fourier series.

61. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 51, wherein said data is representative of physical characteristics and said Fourier series in Fourier space is selected from one of:

71. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 69, wherein the Fourier series in Fourier space, has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ and is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}\frac{4}{\rho_{0_m}z_{0_m}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

72. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 71, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

73. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 71, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

74. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 71, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

117. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 114, whereby the probability expectation value increases with a rate of recalling any part of any of the Fourier series.

118. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method for recognizing a pattern in information, the method comprising:

inputting information;

(Fig. 2, "Data", described at page 8, line 20)

representing the information as a plurality of Fourier series in Fourier space;

(Fig. 2, processor (22), described at page 8 lines 21-22)

forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters and by coupling the filtered Fourier series based on a probability distribution, wherein when at least two of the Fourier series have been associated recognition of a pattern in the information is achieved; and

(Fig. 2, described on page 13, lines 5-26)

outputting a recognized pattern in the information.

(Fig. 2, described on page 13, lines 20-26, when the desired probability operand value is a desired value, a pattern is recognized and can be outputted as recognized. In the particular disclosed example on page 13, the recognized pattern is outputted in a manner such that the Fourier series containing the recognized pattem is combined with said another Fourier series to a provide string of recognized information represented by the Fourier series (which is recited in dependent claim 120). The recognized string can be increased in size as desired by repeating the steps of the method.)

119. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 118, wherein coupling is based on spectral similarity of said Fourier series.

120. *(page 8, line 19 to page 16, line 15; page 16, line 16 to page 21, line 8)* A method according to claim 118, further comprising adding the associated Fourier series to form a string, and ordering the string.

121. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 118, wherein the filter is a time delayed Gaussian filter in the time domain.

122. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 118, wherein the probability distribution is Poissonian.

123. *(page 16, line 16 to page 21, line 8)* A method according to claim 120, wherein the string is selected from one of:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

and

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}\frac{4}{\rho_{0_{s,m}}z_{0_{s,m}}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

124. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 123, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

125. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 123, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

126. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 123, wherein each of the data parameters $N_{m_{\rho_0}}$ and

$N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

127. *(page 16, line 16 to page 21, line 8, Fig. 4)* A method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the method comprising:

a.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

(string memory section 44)

b.) selecting at least two filters from a selected set of filters;

(two filters 48 and 50 from a set of filters 52)

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

(high level memory section 54)

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

(spectral similarity analyzer 56)

h.) determining a probability expectation value based on the spectral similarity;

(probability expectation value analyzer 58)

i.) generating a probability operand based on the probability expectation value;

(probability operand generator 60)

j.) repeating steps b-i until the probability operand has a desired value, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

(Processor 42 determines the value of the probability operand. The desired value in the disclosed example on pages 16-18 is one, but can be any value as desired by the user. When the probability operand determined by processor 42 is equal to the desired value a pattern has been recognized.)

k.) storing the summed Fourier series to an intermediate memory;

(intermediate memory section 62)

l.) removing the selected filters from the selected set of filters to form an updated set of filters;

(set of filters 52)

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;

(*selecting updated filter 62 from set of filters 52)*

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;

(intermediate memory section 62)

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;

(high level memory section 54)

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability operand has a desired value a pattern in information has been recognized an order formatted pattern in the information has been established;

(processor 42)

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

(processor 42)

aa.) storing the Fourier series in the intermediate memory in the high level memory.

(high level memory section 54)

128. *(page 2, lines 15-25)* A method according to claim 127, wherein information is represented by a sum of Fourier series in Fourier space.

129. *(page 16, line 16 to page 21, line 8; page 7, lines 14-16; page 10, line 34 to page 11, line 3; page 10, line 34 to page 12, line 2)* A method according to claim 127, further comprising encoding data which includes modulating at least one of said Fourier components to provide an input context.

130. *(page 6, line 25 to page 7, line 10)* A method according to claim 127, wherein inputted information comprises data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

131. *(page 8, lines 19-29)* A method according to claim 127, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

132. (*page 16, line 16 to page 21, line 8)* A method according to claim 127, wherein said probability operands having a value selected from a set of zero and one.

133. (*page 16, line 16 to page 21, line 8)* A method according to claim 132, wherein said desired values are one.

134. *(page 12, lines 25-34; page 16, line 16 to page 21, line 8)* A method according to claim 127, wherein the high level memory is initialized with standard inputs.

135. *(page 16, line 16 to page 21, line 8)* A method according to claim 127, wherein the ordering is according to one of temporal order, cause and effect relationships, size order, intensity order, before-after order, top-bottom order, or left-right order.

136. *(page 16, line 16 to page 21, line 8)* A method according to claim 127, wherein each filter of the set of filters is a time delayed Gaussian filter having a half-width parameter α which determines the amount of the string that is sampled.

137. *(page 16, line 16 to page 21, line 8)* A method according to claim 127, wherein each filter of the set of filters is a time delayed Gaussian filter having a delay parameter $\frac{\sqrt{N}}{\alpha}$ which corresponds to a time point.

138. *(page 16, line 16 to page 21, line 8)* A method according to claim 137, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the correct order to form the string, wherein the ordered string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal

propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

139. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 138, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

140. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 138, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

141. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 138, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

142. *(page 101, lines 15-18; page 16, line 16 to page 21, line 8)* A method according to claim 138, wherein $v_{s,m}t_{0_{s,m}} = \rho_{0_{s,m}}$ and $k_\rho = k_z$ such that the string in Fourier space is one dimensional in terms of k_ρ and is represented by

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-jk_\rho \rho_{fb_{s,m}}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ is a constant such as the signal propagation velocity in the ρ direction, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ is a delay parameter and $\alpha_{s\rho 0}$ is a half-width parameter of a corresponding Gaussian filter in the k_ρ-space, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{fb_{s,m}}$ is a constant such as the

signal propagation velocity, $a_{0_{s,m}}$ is a constant, k_ρ is the frequency variable, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$ and $\rho_{0_{s,m}}$ are data parameters.

143. *(page 101, lines 15-18; page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 142, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

144. *(page 101, lines 15-18; page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 142, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

145. *(page 101, lines 15-18; page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 142, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

146. *(page 16, line 16 to page 21, line 8)* A method according to claim 127, wherein the probability expectation value is based upon Poissonian probability.

147. *(page 16, line 16 to page 21, line 8)* A method according to claim 146, wherein the probability expectation value is characterized by

$$\prod_s \left[p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right) \exp\left[-\beta_s^{-2} \left(\frac{1 - \cos 2\phi_s}{2} \right) \right] \cos(\delta_s + 2\sin\phi_s) \right]$$

wherein P is the maximum probability that at least one other Fourier series is active given that a first Fourier series is active, $p_{\uparrow_s}$ is a probability of a Fourier series becoming active in the absence of coupling from at least one other active Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at

least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor.

148. *(page 16, line 16 to page 21, line 8)* A method according to claim 147, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$

$$\exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}} \right) - \left(\frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}} \right) \right)^2}{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data.

149. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 148, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

150. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 148, wherein each of the data parameters $N_{m_{\rho_0}}$ and

$N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

151. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 148, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

152. *(page 16, line 16 to page 21, line 8)* A method according to claim 148, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fb m_1}}{v_{fb m_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fb m_s}}{v_{fb m_s}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fb m_1}}{v_{fb m_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb m_1} = v_{fb m_1} t_{fb m_1}$ and $\rho_{fb m_s} = v_{fb m_s} t_{fb m_s}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb m_1}$ and $t_{fb m_s}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb m_1}$, and $v_{fb m_s}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

153. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 152, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each

Fourier component is inversely proportional to the amplitude of the physical characteristic.

154. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 152, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

155. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 152, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

156. *(page 7, lines 11-33, and page 23, lines 8-21, the italicized numbers refer to Fig. 1)* A system *(10)* for recognizing a pattern in information comprising data and establishing an order formatted pattern in information, the system comprising:

an input layer *(12)* that receives data representative of physical characteristics or representations of physical characteristics within an input context of the physical characteristics and transforms the data into a Fourier series in Fourier space wherein the input context is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies;

a memory *(20)* comprising a set of initial ordered Fourier series;

an association layer *(14)* that receives a plurality of the Fourier series in Fourier space from the memory, recognizes a pattern in information represented by the Fourier series, forms a string comprising a sum of Fourier series, and stores the string in memory;

a string ordering layer *(16)* that receives the string and at least one ordered Fourier series from the memory, orders the Fourier series contained in the string by establishing an order formatted pattern in information to form an ordered string, and stores the ordered string in memory; and

a predominant configuration layer *(18)* that receives multiple ordered strings from the memory, forms complex ordered strings from the ordered strings, stores the

complex ordered strings to the memory, and activates the components of any of the layers of the system to recognize a pattern in information and establish an order formatted pattern in information.

157. *(at page 21, line 9 to page 22, line 33, the italicized reference numbers refer to Fig. 5)* A method of recognizing a pattern in information, the method comprising:

a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on an activation rate of the corresponding component;
(probability parameter generator 66)

b.) storing the activation probability parameter in memory *(20)*;

b.) generating a probability operand based on the activation probability parameter;
(activation probability operand generator 70)

d.) if said probability operand is a desired value, activating any component of one or more of the group consisting of an input layer *(12)*, an association layer *(14)*, a string ordering layer *16)*, and a predominant configuration layer *(18)*, the activation being based on the activation probability parameter, wherein a pattern in information is recognized when said probability operand is said desired value;

e.) repeating steps a-d until a pattern is recognized in the information.

158. *(page 21, line 9 to page 22, line 33)* A method according to claim 157, wherein said probability operand having a value selected from a set of zero and one.

159. *(page 21, line 9 to page 22, line 33)* A method according to claim 158, wherein said desired value is one.

160. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15, page 23, lines 8-21)* A computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information comprising data, the computer program comprising instructions which, when executed by a computer, perform the steps of:

encoding data as parameters of a plurality of Fourier components in Fourier space;
(Fig. 2, processor (22), described at page 8 lines 21-22)

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

(Fig. 2 described at page 13 lines 4-6)

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

(Fig. 2, filter 34, described at page 13 lines 7-10)

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

(Fig. 2, filter 34, described at page 13 lines 7-10)

determining a spectral similarity between said modulated Fourier series and another Fourier series;

(Fig. 2, spectral similarity analyzer 36, described at page 13 lines 10-15)

determining a probability expectation value based on said spectral similarity;

(Fig. 2, probability expectation analyzer 38, described at page 13 lines 14-17)

generating a probability operand based on said probability expectation value; and

(Fig. 2, probability operand generator 40, described at page 13 lines 17-20)

selecting a desired value for said probability operand, wherein recognition of a pattern in said information is obtained when said probability operand having said desired value.

(Fig. 2, described on page 13, lines 20-26, in this disclosed example, the desired probability operand value was selected to be one, but can be any value desired by the user. When the desired probability operand value is a desired value, a pattern is recognized. In the particular disclosed example on page 13, the Fourier series containing the recognized pattern is combined with said another Fourier series to a provide string of recognized information represented by the Fourier series (which is recited in dependent claim 162). The recognized string can be increased in size as desired by repeating the steps of the method. Recognition is also referred to as "association" or "associated information" in the application.)

161. *(page 6, line 25 to page 7, line 10; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein said data is

inputted from a transducer which transduces physical data into computer readable data.

162. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, further comprising adding said modulated Fourier series and said another Fourier series to form a string of Fourier series in Fourier space when said probability operand has said desired value.

163. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 162, further comprising storing said string of Fourier series to a memory.

164. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein said another Fourier series represents known information.

165. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein said steps of adding said plurality of Fourier components together, sampling at least one of said plurality of Fourier series in Fourier space, modulating said sampled Fourier series in Fourier space, determining a spectral similarity between said modulated Fourier series and another one of said plurality of Fourier series, determining a probability expectation value, and generating a probability operand are repeated until a said probability operand has said desired value.

166. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein said value of said probability operand is selected from a set of zero and one; and wherein said desired value is one.

167. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein said step of encoding data further comprises modulating at least one of said Fourier components to provide an input context.

168. *(page 6, line 25 to page 7, line 10)* A computer-readable medium according to claim 160, wherein inputted information comprises said data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

169. *(page 8, lines 19-29)* A computer-readable medium according to claim 168, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

170. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein said step of adding at least two Fourier components together is conducted to provide at least two Fourier series.

171. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein said data is representative of physical characteristics and said Fourier series in Fourier space is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}\frac{4}{\rho_{0_m}z_{0_m}}a_{0_m}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

wherein a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho0}}$, $N_{m_{z0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

172. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 171, wherein each of $N_{m_{\rho0}}$ and $N_{m_{z0}}$ is proportional to a rate of change of said physical characteristics, and each of ρ_{0_m} and z_{0_m} is inversely proportional to an amplitude of said physical characteristics.

173. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 171, wherein each of $N_{m_{\rho0}}$ and $N_{m_{z0}}$ is proportional to said amplitude of said physical characteristics, and each of ρ_{0_m} and z_{0_m} is inversely proportional to said rate of change of said physical characteristics.

174. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 171, wherein each of $N_{m_{\rho0}}$ and $N_{m_{z0}}$ is proportional to a duration of a signal response of at least one input transducer; and each of ρ_{0_m} and z_{0_m} is inversely proportional to said physical characteristics.

175. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 167, wherein step of encoding said data further comprises encoding said input context as a characteristic time delay which corresponds to a characteristic modulation of said Fourier components or Fourier series at a frequency within a band.

176. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 175, wherein said characteristic modulation frequency band represents said input context according to at least

one of a transducer, a specific transducer element, and at least one of fundamental relationship including a physical context, a temporal order, a cause and effect relationships including a temporal order, a size order, an intensity order, a before-and-after order, a top-and-bottom order, and a left-and-right order.

177. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 176, wherein said transducer has n levels of subcomponents, and is assigned a master time interval with $n+1$ sub time intervals in a hierarchical manner corresponding to said n levels of the transducer subcomponents, and wherein a data stream from a n^{th} level subcomponent of said transducer is recorded as a function of time in the $n+1$ sub time intervals, each of said $n+1$ time intervals representing a time delay that corresponds to said characteristic modulation frequency band representing said input context.

178. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 177, wherein the input context is based on the identity of the specific transducer and transducer subcomponents.

179. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 177, wherein the characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$ which corresponds to the time delay $\delta(t-t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay.

180. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 179, wherein the step of adding at least two Fourier components together further comprises storing the characteristic modulation frequency in a distinct memory location within the band encoded as a delay in time.

181. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 179, wherein the Fourier series in Fourier space, has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ and is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\operatorname{sin}\left(k_\rho\frac{N_{m_{\rho0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho0}}}{2}\right)\operatorname{sin}\left(k_z\frac{N_{m_{z0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z0}}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}\frac{4}{\rho_{0_m}z_{0_m}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\operatorname{sin}\left(k_\rho\frac{N_{m_{\rho0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho0}}}{2}\right)\operatorname{sin}\left(k_z\frac{N_{m_{z0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z0}}}{2}\right)$$

wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

182. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 181, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

183. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 181, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

184. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 181, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal

response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

185. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 179, wherein the string has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ is selected from one of:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$

$$\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

and

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}\frac{4}{\rho_{0_{s,m}}z_{0_{s,m}}}e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$

$$\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $\rho_{t_{s,m}}=v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}}=v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

186. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 185, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

187. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 185, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the

physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

188. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 185, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

189. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein the Fourier series in Fourier space, has a characteristic modulation having a frequency within the band represented by $e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}$ and is selected from one of:

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho_0}}N_{m_{z_0}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

and

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}\frac{4}{\rho_{0_m}z_{0_m}}e^{-jk_\rho(\rho_{fb_m}+\rho_{t_m})}\sin\left(k_\rho\frac{N_{m_{\rho_0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho_0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z_0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z_0}}}{2}\right)$$

wherein $\rho_{t_m}=v_{t_m}t_{t_m}$ is the modulation factor which corresponds to the physical time delay t_{t_m}, $\rho_{fb_m}=v_{fb_m}t_{fb_m}$ is the modulation factor which corresponds to the specific transducer time delay t_{fb_m}, v_{t_m} and v_{fb_m} are constants such as the signal propagation velocities, a_{0_m} is a constant, k_ρ and k_z are the frequency variables, n, m, and M are integers, and $N_{m_{\rho_0}}$, $N_{m_{z_0}}$, ρ_{0_m}, and z_{0_m} are data parameters.

190. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 189, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

191. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 189, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

192. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 189, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

193. *(page 16, line 16 to page 21, line 8)* A computer-readable medium according to claim 189, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

194. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 193, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

195. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 193, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

196. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A method according to claim 193, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

197. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein the step of adding at least two of said Fourier components together further comprises creating transducer strings by obtaining a Fourier series from at least two selected transducers and adding the Fourier series.

198. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 197, further comprises selecting transducers that are active simultaneously.

199. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 198, wherein the transducer string is stored in a distinct memory location wherein a characteristic modulation having a frequency within the band in Fourier space is represented by $e^{-j2\pi f t_0}$ which corresponds to the time

delay $\delta(t - t_0)$ wherein f is the frequency variable, t is the time variable, and t_0 is the time delay.

200. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 199, wherein the step of adding at least two of said Fourier components together further comprises recalling any part of the transducer string from the distinct memory location which thereby causes additional Fourier series of the transducer string to be recalled.

201. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein the filter is a time delayed Gaussian filter in the time domain.

202. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 201, wherein the Gaussian filter comprises a plurality of cascaded stages each stage having a decaying exponential system function between stages.

203. *(page 64, lines 33-36)* A computer-readable medium according to claim 201, wherein the Gaussian filter is modulated in the time domain to produce a frequency shift of the sampling and modulation in the frequency domain.

204. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 201, wherein the filter is characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{\frac{\left(t - \frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ is a delay parameter, α is a half-width parameter, and t is the time parameter.

205. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 201, wherein the filter, in frequency space, is characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter.

206. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, wherein the probability expectation value is based upon Poissonian probability.

207. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 206, wherein the probability expectation value is characterized by

$$\prod_{s}\left[p_{\uparrow_s}+\left(P-p_{\uparrow_s}\right)\exp\left[-\beta_s^{-2}\left(\frac{1-\cos 2\phi_s}{2}\right)\right]\cos\left(\delta_s+2\sin\phi_s\right)\right]$$

wherein P is the maximum probability of at least one other Fourier series being associated with a first Fourier series, $p_{\uparrow_s}$ is a probability of at least one other Fourier series being associated with a first Fourier series in the absence of coupling of the first Fourier series with the at least one other Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor.

208. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 207, wherein β_s^2 is characterized by

$$\beta_s^2=(8\pi)^2\frac{1}{\sqrt{2\pi}}\sqrt{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}}$$

$$\sum_{m_1=1}^{M_1}a_{0_{m_1}}N_{m_1}\sum_{m_s=1}^{M_s}a_{0_{m_s}}N_{m_s}\exp-\left\{\frac{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1}-\frac{\sqrt{N_s}}{\alpha_s}+\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}-\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}\right)^2}{2}\right\}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and

$a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

209. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 208, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

210. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 208, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

211. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 208, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

212. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 208, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} - \sum_{m_s=1}^{M_s} \frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and

$a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

213. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 212, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

214. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 212, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

215. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 212, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

216. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15, and page 23, lines 8-21)* A computer-readable medium according to claim 208, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$

$$\exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}} \right) - \left(\frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}} \right) \right)^2}{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

217. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium according to claim 216, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

218. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium according to claim 216, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

219. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium according to claim 216, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

220. *(page 16, line 16 to page 21, line 8)* A computer-readable medium according to claim 208, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fbm_1}}{v_{fbm_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fbm_s}}{v_{fbm_s}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} + \frac{\rho_{fbm_1}}{v_{fbm_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fbm_1} = v_{fbm_1} t_{fbm_1}$ and $\rho_{fbm_s} = v_{fbm_s} t_{fbm_s}$ are the modulation factors which corresponds to the specific transducer time delay t_{fbm_1} and t_{fbm_s}, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, v_{fbm_1}, and v_{fbm_s} are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

221. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium according to claim 220, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

222. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium according to claim 220, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

223. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium according to claim 220, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

224. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, further comprising linking at least two Fourier series stored in a memory comprising the steps of

a.) generating a probability expectation value that recalling any part of one of the Fourier series from the memory causes at least another Fourier series to be recalled from the memory;

b.) storing the probability expectation value to memory;

c.) generating a probability operand based on the probability expectation value, and

d.) recalling the at least another Fourier series from the memory if the operand has a desired value.

225. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 224, wherein said probability operand is a value selected from a set of zero and one.

226. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 225, wherein said desired value is one.

227. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 160, whereby the probability expectation value increases with a rate of recalling any part of any of the Fourier series.

228. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

representing the information as a plurality of Fourier series in Fourier space; and

(Fig. 2, processor 22, described at page 8, lines 21-22)

forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters and by coupling the filtered Fourier series based on a probability distribution, wherein when at least two of the Fourier series have been associated recognition of a pattern in the information is achieved.

229. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 228, wherein coupling is based on spectral similarity of said Fourier series.

230. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 228, further comprising adding the associated Fourier series to form a string, and ordering the string.

231. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 228, wherein the filter is a time delayed Gaussian filter in the time domain.

232. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 228, wherein the probability distribution is Poissonian.

233. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 230, wherein the string is selected from one of:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

and

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}\frac{4}{\rho_{0_{s,m}}z_{0_{s,m}}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

234. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 233, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

235. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 233, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

236. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 233, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

237. *(page 16, line 16 to page 18, line 21, and page 23, lines 8-21, the italicized reference numbers refer to Fig. 4)* A computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

(string memory section 44)

b.) selecting at least two filters from a selected set of filters;

(two filters 48 and 50 from a set of filters 52)

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

(high level memory section 54)

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

(spectral similarity analyzer 56)

h.) determining a probability expectation value based on the spectral similarity;

(probability expectation value analyzer 58)

i.) generating a probability operand based on the probability expectation value;

(probability operand generator 60)

j.) repeating steps b-i until the probability operand has a desired value, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

(Processor 42 determines the value of the probability operand. The desired value in the disclosed example on pages 16-18 is one, but can be any value as desired by the user. When the probability operand determined by processor 42 is equal to the desired value a pattern has been recognized.)

k.) storing the summed Fourier series to an intermediate memory;

(intermediate memory section 62)

l.) removing the selected filters from the selected set of filters to form an updated set of filters;

(set of filters 52)

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;

(selecting updated filter 62 from set of filters 52)

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;

(intermediate memory section 62)

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;

(high level memory section 54)

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability operand has a desired value a pattern in information has been recognized an order formatted pattern in the information has been established;

(processor 42)

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

(processor 42)

aa.) storing the Fourier series in the intermediate memory in the high level memory.

(high level memory section 54)

238. *(page 2, lines 15-25, page 16, line 16 to page 21, line 8)* A computer-readable medium according to claim 237, wherein information is represented by a sum of Fourier series in Fourier space.

239. *(page 16, line 16 to page 21, line 8; page 7, lines 14-16; page 10, line 34 to page 11, line 3; page 10, line 34 to page 12, line 2)* A computer-readable medium according to claim 237, further comprising encoding data which

includes modulating at least one of said Fourier components to provide an input context.

240. *(page 6, line 25 to page 7, line 10)* A computer-readable medium according to claim 237, wherein inputted information comprises data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

241. *(page 8, lines 19-29)* A computer-readable medium according to claim 237, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

242. (*page 16, line 16 to page 21, line 8)* A computer-readable medium according to claim 237, wherein said probability operands having a value selected from a set of zero and one.

243. (*page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 242, wherein said desired values are one.

244. *(page 12, lines 25-34; page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 237, wherein the high level memory is initialized with standard inputs.

245. (*page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 237, wherein the ordering is according to one of the list of: temporal order, cause and effect relationships, size order, intensity order, before-after order, top-bottom order, or left-right order.

246. (*page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 237, wherein each filter of the set of filters is a time delayed Gaussian filter having a half-width parameter α which determines the amount of the string that is sampled.

247. *(page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 237, wherein each filter of the set of filters is a time delayed Gaussian filter having a delay parameter $\frac{\sqrt{N}}{\alpha}$ which corresponds to a time point.

248. *(page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 247, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the correct order to form the string, wherein the ordered string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho 0}}N_{s,m_{z0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho 0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

249. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 248, wherein each of the data parameters $N_{m_{\rho 0}}$ and $N_{m_{z0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

250. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 248, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

251. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 248, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

252. *(page 64, lines 33-36)* A computer-readable medium to claim 248, wherein $v_{s,m}t_{0_{s,m}} = \rho_{0_{s,m}}$ and $k_\rho = k_z$ such that the string in Fourier space is one dimensional in terms of k_ρ and is represented by

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-jk_\rho \rho_{fb_{s,m}}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ is a constant such as the signal propagation velocity in the ρ direction, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ is a delay parameter and $\alpha_{s\rho 0}$ is a half-width parameter of a corresponding Gaussian filter in the k_ρ-space, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{fb_{s,m}}$ is a constant such as the signal propagation velocity, $a_{0_{s,m}}$ is a constant, k_ρ is the frequency variable, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$ and $\rho_{0_{s,m}}$ are data parameters.

253. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 252, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

254. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 252, wherein each of the data parameters

$N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

255. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 252, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

256. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 237, wherein the probability expectation value is based upon Poissonian probability.

257. (*page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 256, wherein the probability expectation value is characterized by

$$\prod_s \left[p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right) \exp\left[-\beta_s^{-2}\left(\frac{1-\cos 2\phi_s}{2}\right)\right] \cos\left(\delta_s + 2\sin\phi_s\right)\right]$$

wherein P is the maximum probability that at least one other Fourier series is active given that a first Fourier series is active, $p_{\uparrow_s}$ is a probability of a Fourier series becoming active in the absence of coupling from at least one other active Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor.

258. (*page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 257, wherein β_s^2 is characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$

$$\exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \left(\frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} + \frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}} \right) - \left(\frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} + \frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}} \right) \right)^2}{2} \right\}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb_{m_1}} = v_{fb_{m_1}} t_{fb_{m_1}}$ and $\rho_{fb_{m_s}} = v_{fb_{m_s}} t_{fb_{m_s}}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb_{m_1}}$ and $t_{fb_{m_s}}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb_{m_1}}$, and $v_{fb_{m_s}}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$, $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

259. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 258, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

260. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 258, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

261. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 258, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

262. *(page 16, line 16 to page 21, line 8)* A computer-readable medium to claim 258, wherein ϕ_s is characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m1}}}{2v_{m_1}} + \frac{\rho_{fb m_1}}{v_{fb m_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}} + \frac{\rho_{fb m_s}}{v_{fb m_s}} + \frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m1}}}{2v_{m_1}} + \frac{\rho_{fb m_1}}{v_{fb m_1}} + \frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

wherein $\rho_{t_{m_1}} = v_{t_{m_1}} t_{t_{m_1}}$ and $\rho_{t_{m_s}} = v_{t_{m_s}} t_{t_{m_s}}$ are the modulation factors which corresponds to the physical time delays $t_{t_{m_1}}$ and $t_{t_{m_s}}$, respectively, $\rho_{fb m_1} = v_{fb m_1} t_{fb m_1}$ and $\rho_{fb m_s} = v_{fb m_s} t_{fb m_s}$ are the modulation factors which corresponds to the specific transducer time delay $t_{fb m_1}$ and $t_{fb m_s}$, respectively, $v_{t_{m_1}}$, $v_{t_{m_s}}$, $v_{fb m_1}$, and $v_{fb m_s}$ are constants such as the signal propagation velocities, $\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1, and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters.

263. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 262, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the rate of change of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the amplitude of the physical characteristic.

264. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 262, wherein each of the data parameters

$N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the amplitude of the physical characteristic and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the rate of change of the physical characteristic.

265. *(page 16, line 16 to page 21, line 8; page 8, line 30 to page 10, line 3)* A computer-readable medium to claim 262, wherein each of the data parameters $N_{m_{\rho_0}}$ and $N_{m_{z_0}}$ of the Fourier series component is proportional to the duration of a signal response of each transducer and each of the data parameters ρ_{0_m} and z_{0_m} of each Fourier component is inversely proportional to the physical characteristic.

266. *(page 21, line 9 to page 22, line 33)* A computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information and establishing an order formatted pattern in information, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) recording ordered strings comprising Fourier series to a high level memory, Fourier series representing information;

(high level memory section 54)

b.) forming association between Fourier series of the ordered strings to form complex strings and recognizing a pattern in information;

(association layer 14)

c.) ordering the Fourier series of the complex strings to form complex ordered strings representing recognized information and establishing an order formatted pattern in information, and

(string ordering layer 16)

d.) storing the complex ordered strings to the high level memory.

(complex ordered string section 72, high level memory section 54)

267. *(page 21, line 9 to page 22, line 33)* A computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information comprising data and forming a predominant configuration, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on an activation rate of the corresponding component;

(activation probability parameter generator 66)

b.) storing the activation probability parameter in memory;

(memory 20)

c.) generating a probability operand based on the activation probability parameter;

(activation probability operand generator 70)

d.) if said probability operand is a desired value, activating any component of one or more of the group consisting of an input layer, an association layer, a string ordering layer, and a predominant configuration layer, the activation being based on the activation probability parameter, wherein recognition of a pattern in information is achieved when said probability operand is said desired value, and

(input layer 12, association layer 14, string ordering layer 16, predominant configuration layer 18, while the desired value is one in the disclosed example, any suitable value can be selected by the user)

e.) repeating steps a-d to form a predominate configuration.

268. *(page 21, line 9 to page 22, line 33)* A method according to claim 267, wherein said probability operand having a value selected from a set of zero and one.

269. *(page 21, line 9 to page 22, line 33)* A method according to claim 268, wherein said desired value is one.

270. *(page 1, line 32 to page 2, line 14; page 21, line 9 to page 23, line 26)* A computer program product for recognizing a pattern in information for use in a computer including a central processing unit and a memory, the memory maintaining a set of initial ordered Fourier series, the computer program product comprising:

a computer readable medium;

program code means embodied in the computer readable medium, the program code means comprising:

means for receiving data representative of physical characteristics or representations of physical characteristics within an input context of the physical

characteristics and transforming the data into a Fourier series in Fourier space wherein the input context is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies;

(input layer 12)

means for receiving a plurality of the Fourier series in Fourier space including at least one ordered Fourier series from the memory, forming a string comprising a sum of the Fourier series and storing the string in memory;

(association layer 14, memory 20)

means for retrieving the string from memory, ordering the Fourier series contained in the string to form an ordered string and storing the ordered string in memory; and

(string ordering layer 16)

means for retrieving multiple ordered strings from the memory, forming complex ordered strings from the ordered strings and storing the complex ordered strings to the memory.

(predominant configuration layer 18)

271. *(page 1, line 32 to page 2, line 14; page 21, line 9 to page 23, line 26)* A method of recognizing a pattern in information comprising data and establishing an order formatted pattern in information, the method comprising:

encoding inputted data as a plurality of Fourier components in Fourier Space and form a plurality of Fourier series from said Fourier components, said Foureir series representing information comprising data and input context;

associating said plurality of Fourier series with each other according to spectral similarities between said plurality of Fourier series to form a string, said string being a sum of associated plurality of Fourier series;

ordering said plurality of Fourier series within said string based on relative degree of association of order formatted subsets of said string with relevant aspects of a standard ordered string;

(predominant configuration layer 18 receives ordered strings from the high level memory section 54 and form more complex ordered strings)

assigning an activation probability parameter to each of said plurality of Fourier components and to each of said plurality of Fourier series to produce a predominant configuration string, generating a probability operand based on said activation probability parameter, said probability operand determining whether an activation of any one of said plurality of Fourier component and said plurality of Fourier series is to cause an activation of an associated another of said plurality of Fourier components and said plurality of Fourier series from said ordered string; and

(the predominant configuration layer 18 includes an activation probability parameter generator 66)

storing said predominant configuration string in a memory, thereby a pattern in newly inputted information can be recognized.

(memory 20)

272. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 271, wherein said step of associating said plurality of Fourier series comprises sampling and modulating at least one of said plurality of Fourier series with at least one filter.

273. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 272, wherein said at least one filter comprises a time delayed Gaussian filter in time domain.

274. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 271, wherein said step of ordering said plurality of Fourier series comprises sampling and modulating at least two of said plurality of Fourier series with at least two filters from a set of filters.

275. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 274, wherein said at least two filters comprises a time delayed Gaussian filter in time domain.

276. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 271, wherein said step of associating ones of said plurality of Fourier series comprises coupling said plurality of Fourier series based on a probability distribution.

277. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 271, wherein said probability distribution is a Poissonian distribution.

278. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 271, wherein said coupling is based on a spectral similarity of said plurality of Fourier series.

279. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 271, wherein said probability operand is selected from the group of one and zero.

280. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 279, wherein said desired value is one.

281. *(at page 7, lines 11-33 and page 23, lines 8-26, the italicized reference numbers refer to Fig. 1)* A system *(10)* for recognizing a pattern in information comprising data, the method comprising:

an input layer *(12)* operable to receive said data, and to encode said received data as parameters of a plurality of Fourier series in Fourier space, said plurality of Fourier series including input context of said data;

a memory *(20)* comprising a set of initial ordered Fourier series;

an association layer *(14)* operable to add associated Fourier series together to form a string;

an ordering layer *(16)* operable to order said string based on relative degree of association of order formatted subsets of said string with relevant aspects of characteristics with respect to at least one of said initial ordered Fourier series to form an ordered string;

a predominant configuration layer *(18)* for receiving said ordered string and for assigning an activation probability parameter to each of said plurality of Fourier series to produce a predominant configuration string, generating a probability operand based on said activation probability parameter, said probability operand determining whether an activation of any one of said plurality of Fourier components and said plurality of Fourier series is to cause an activation of an associated another one of said plurality of Fourier components or Fourier series; and

a memory *(20)* adapted to store said predominant configuration string, said predominant configuration string allowing a determination of a relative association of a newly inputted information to said inputted information already processed, thereby recognition of a pattern in said information can be recognized.

282. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A system according to claim 281, wherein said association layer is operable to associate Fourier series based on a spectral similarity between one another.

283. *(page 1, line 32 to page 2, line 14; page 21, line 9 to page 23, line 26)* A system according to claim 281, wherein said probability operand is determined based on a historical value of said activation probability parameter and an activation rate of respective Fourier series.

284. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A system according to claim 281, wherein said information context is encoded in time as delays corresponding to modulation of each Fourier component and Fourier series at corresponding frequencies.

285. *(page 1, line 32 to page 2, line 14; page 21, line 9 to page 23, line 26)* A method of recognizing a pattern in information comprising data, the method comprising:

providing an input layer operable to receive data;

providing an association layer operable to add associated portions of said data together to form a string;

providing an ordering layer operable to order said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered string;

(predominant configuration layer 18 receives ordered strings from the high level memory section 54 and forms more complex ordered strings)

providing a predominant configuration layer operable to receive a plurality of ordered strings to form a complex ordered string therefrom;

assigning an activation probability parameter to each of said input layer, said association layer, said ordering layer and said predominant configuration layer, said activation probability parameter being determined based on a historical value of said activation probability parameter and an activation rate of respective ones of said input layer, said association layer, said ordering layer and said predominant configuration layer;

(the predominant configuration layer 18 includes an activation probability parameter generator 66)

generating a probability operand based on the activation probability parameter; and

(activation probability operand generator 70)

activating one or more of said input layer, said association layer, said ordering layer, said predominant configuration, said ordering layer, said predominant configuration layer, and said association layer if said probability operand has a desired value, whereby a pattern in said information is recognized according to a historical associative pattern in said data.

(input layer 12, association layer 14, string ordering layer 16, predominant configuration layer 18, while the desired value is one in the disclosed example, any suitable value can be selected by the user)

286. *(page 16, line 16 to page 21, line 8)* A method according to claim 285, wherein said step of providing an ordering layer comprises ordering said string according to a plurality of associations between the information of the plurality of order formatted subset Fourier series and at least one ordered Fourier series from a high level memory.

287. *(page 7, lines 11-34)* A method according to claim 285, wherein said step of providing an input layer comprises providing an input layer operable to encode said received data as parameters of a plurality of Fourier series in Fourier space.

288. *(page 7, lines 11-34)* A method according to claim 285, wherein said step of providing an association layer comprises providing said association layer to associate Fourier series based on a spectral similarity between one another.

289. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 285, wherein said probability operand has a binary value of one and zero, and said desired value is one.

290. *(page 2, lines 15-33, page 8, line-25, page 13, lines1-26, and page 23, lines 8-26, referring to Fig. 2)* A computer readable medium having stored thereon a computer program to implement a method of recognizing a pattern in information comprising data, said computer program comprising a plurality of codes for executing the steps of:

encoding said data as parameters of a plurality of Fourier components in Fourier space;

(Fourier transform processor 22, described on page 8, line 20)

adding said plurality of Fourier components together to form a plurality of Fourier series in Fourier space, said plurality of Fourier series representing inputted information;

(page 13, lines 4-6)

sampling at least one of said plurality of Fourier series in Fourier space with a filter to form a sampled Fourier series;

(filter 34, described at page 13, lines 7-10)

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

(filter 34, described at page 13, lines 7-10)

determining a spectral similarity between said modulated Fourier series and another one of said plurality of Fourier series;

(spectral similarity analyzer 36, described at page 13, lines 10-15)

determining a probability expectation value based on said spectral similarity;

(probability expectation analyzer 38, described at page 13, lines 14-17)

generating a probability operand based on said probability expectation value; and

(probability operand generator 40, described at page 13, lines 17-20)

adding said modulated Fourier series and said another Fourier series, if said probability operand has a desired value, to form a string of Fourier series in Fourier space, said string representing an association between Fourier series to thereby allow recognition of a pattern in the information.

(described on page 13, lines 20-26, when the desired probability operand value is a desired value, one in this example, a pattern is recognized and can be outputted as recognized. In the particular disclosed example on page 13, the recognized pattern is outputted in a manner such that the Fourier series is combined with said another Fourier series to a provide string of recognized information represented by the Fourier. The recognized string can be increased in size as desired by repeating the steps of the method.)

291. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 290, further comprising

storing said string of Fourier series to a memory.

292. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 290, wherein said probability operand has a value selected from the set of one and zero.

293. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer-readable medium according to claim 292, wherein said desired value is one.

294. *(page 16, line 16 to page 18, line 21, and page 23, lines 8-26, the italicized reference numbers refer to Fig. 4)* A method for recognizing a pattern in information and establishing an order formatted pattern in information with respect to standard ordered information, the method comprising:

b.) obtaining a string comprising a sum of Fourier series from a memory, said string representing information;

(string memory section 44)

b.) selecting at least two filters from a selected set of filters;

(two filters 48 and 50 from a set of filters 52)

c.) sampling the string with the filters such that each of the filters produces a sampled Fourier series, each Fourier series comprising a subset of the string;

d.) modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each filter produces an order formatted Fourier series;

e.) adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space;

f.) obtaining an ordered Fourier series from the memory;

(high level memory section 54)

g.) determining a spectral similarity between the summed Fourier series and the ordered Fourier series;

(spectral similarity analyzer 56)

h.) determining a probability expectation value based on the spectral similarity;
(probability expectation value analyzer 58)

i.) generating a probability operand based on the probability expectation value;
(probability operand generator 60)

j.) repeating steps b-i until the probability operand has a desired value, when the probability operand has a desired value a pattern in information has been recognized and an order formatted pattern in the information has been established;

(Processor 42 determines the value of the probability operand. The desired value in the disclosed example on pages 16-18 is one, but can be any value as desired by the user. When the probability operand determined by processor 42 is equal to the desired value a pattern has been recognized.)

k.) storing the summed Fourier series to an intermediate memory;
(intermediate memory section 62)

l.) removing the selected filters from the selected set of filters to form an updated set of filters;
(set of filters 52)

m.) removing the subsets from the string to obtain an updated string;

n.) selecting an updated filter from the updated set of filters;
(selecting updated filter 62 from set of filters 52)

o.) sampling the updated string with the updated filter to form a sampled Fourier series comprising a subset of the string;

p.) modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to form an updated order formatted Fourier series;

q.) recalling the summed Fourier series from the intermediate memory;
(intermediate memory section 62)

r.) adding the updated order formatted Fourier series to the summed Fourier series from the intermediate memory to form an updated summed Fourier series in Fourier space;

s.) obtaining an updated ordered Fourier series from a high level memory;
(high level memory section 54)

t.) determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series;

u.) determining a probability expectation value based on the spectral similarity;

v.) generating a probability operand based on the probability expectation value;

w.) repeating steps n-v until the probability operand has a desired value or all of the updated filters have been selected from the updated set of filters, when the probability operand has a desired value a pattern in information has been recognized an order formatted pattern in the information has been established;

(processor 42)

x.) if all of the updated filters have been selected before the probability operand has a desired value, then clearing the intermediate memory and returning to step b;

y.) if the probability operand has a desired value, then storing the updated summed Fourier series to the intermediate memory;

z.) repeating steps l-y until one of the following set of conditions is satisfied: the updated set of filters is empty, or the remaining subsets of the string of step m.) is nil; and

(processor 42)

aa.) storing the Fourier series in the intermediate memory in the high level memory,

said updated summed Fourier series representing said plurality of Fourier series in said strings ordered according to a plurality of associations between the information of the plurality of order formatted subset Fourier series and the at least one ordered Fourier series from high level memory.

(high level memory section 54)

295. *(page 16, line 16 to page 21, line 8)* A method according to claim 294, wherein information is represented by a sum of Fourier series in Fourier space.

296. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A method according to claim 294, further comprising encoding data which includes modulating at least one of said Fourier components to provide an input context.

297. *(page 6, line 25 to page 7, line 10)* A method according to claim 294, wherein inputted information comprises data and an input context, said input context mapping on a one to one basis to a physical context, said physical context being a relationship between physical characteristics represented by said inputted information.

298. *(page 8, lines 19-29)* A method according to claim 294, wherein each Fourier component of said at least one Fourier series comprises a quantized amplitude, a frequency, or a phase angle.

299. *(page 1, line 32 to page 2, line 14, page 21, line 9 to page 23, line 26, referring to Fig. 5)* A computer readable medium having stored thereon a computer program to implement a method of recognizing a pattern in information comprising data and establishing an order formatted pattern in the information, said computer program comprising a plurality of codes for executing the steps of:

providing an input layer operable to receive data;

(input layer 12)

providing an association layer operable to add associated portions of said data together to form a string;

(association layer 14)

providing an ordering layer operable to order said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered;

(string ordering layer 16)

providing a predominant configuration layer operable to receive a plurality of ordered strings to form a complex ordered string therefrom;

(predominant configuration layer 18)

assigning an activation probability parameter to each of said input layer, said association layer, said ordering layer and said predominant configuration layer, said activation probability parameter being determined based on a historical value of said activation probability parameter and an activation rate of respective ones of said input layer, said association layer, said ordering layer and said predominant configuration layer;

generating a probability operand based on the activation probability parameter; and

(activation probability parameter generator 66)

activating one or more of said input layer, said association layer, said ordering layer, said predominant configuration, said ordering layer, said predominant configuration layer, and said association layer if said probability operand has a desired value, whereby a pattern in said information is recognized according to a historical associative pattern in said data.

(input layer 12, association layer 14, string ordering layer 16, predominant configuration layer 18, while the desired value is one in the disclosed example, any suitable value can be selected by the user)

300. *(page 7, lines 11-34)* A computer readable medium according to claim 299, wherein said input layer is operable to encode said received data as parameters of a plurality of Fourier series in Fourier space.

301. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer readable medium according to claim 299, wherein said association layer is operable to associate ones of said plurality of Fourier series based on a spectral similarity between one another.

302. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer readable medium according to claim 299, wherein said probability operand has a binary value of one or zero

303. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15)* A computer readable medium according to claim 302, wherein said desired value is one.

304. *(page 1, line 29 to page 4, line 30, page 21, line 9 to page 23, line 26, referring to Fig. 5)* A computer program product for use in a system for recognizing a pattern in information comprising data, said computer program product comprising:

a computer readable medium having stored thereon program code means, said program code means comprising:

means for receiving data, and to encode said received data as parameters of a plurality of Fourier series in Fourier space, said plurality of Fourier series including input context of said data;

(input layer 12)

means for associating Fourier series together to form a string;

(association layer 14)

means for ordering said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered string; and

(string ordering layer 16)

means for forming a complex ordered string from a plurality of ordered strings, said complex ordered string representing a historical association and order of processed and stored information to thereby allow recognition of a pattern in information.

(predominant configuration layer 18)

305. *(page 1, line 29 to page 4, line 30; page 21, line 9 to page 23, line 26)* A computer program according to claim 304, further comprising storing said complex ordered string in high level memory.

306. *(page 1, line 29 to page 4, line 30; page 21, line 9 to page 23, line 26)* A computer program product according to claim 305, wherein said means for associating is operable to associate ones of said plurality of Fourier series based on a spectral similarity between one another.

307. *(page 6, line 25 to page 23, line 26)* A data structure in a memory for access by a computer program for processing information, said data structure allowing an efficient recognition of a pattern in newly presented information comprising data and input context representing characteristic in relational

association with information stored in said memory, said data structure comprising:

a plurality of transduced data objects, each of said plurality of transduced data objects providing an input data object representative of characteristics received from a transducer acting on a signal provided by the characteristics encoded as a Fourier series in Fourier space;

(input layer 12)

a plurality of memory data objects stored in memory registers corresponding to the input data objects;

(register 26 of memory 20)

a plurality of association data objects, each of said plurality of association data objects being a sum of associated ones of said plurality of memory data objects or transduced data objects;

(association layer 14)

a plurality of order formatted data objects, each of said plurality of order formatted data objects being one of said plurality of association data objects arranged in a hierarchically order of relative degree of association of relevant aspects of said information with respect to a standard plurality of association data objects;

(string ordering layer 16)

a plurality of activation probability objects, each of said plurality of activation probability objects being assigned to respective one of said plurality of transduced data objects, input data objects, memory data objects, said plurality of association data objects and said plurality of order formatted data objects;

(activation probability generator 66)

a plurality of probability operands being assigned to respective plurality of transduced data objects, input data objects, memory data objects, said plurality of association data objects and said plurality of order formatted data objects, each based on said activation probability objects;

(activation probability operand generator 70)

wherein each of said plurality of transduced data objects, said input data objects, said memory data objects, said plurality of association data objects and said plurality of order formatted data objects is activated when one of said plurality of probability operands has a desired value; and

(predominant configuration layer 18 discussed on page 22, lines 8-33)

wherein a value of each of said plurality of activation probability objects being determined based on historical values and frequency of activation of said respective one of said plurality of transduced data objects, input data objects, memory data objects, said plurality of association data objects and said plurality of order formatted data objects to thereby allow recognition of characteristics of said newly presented information based on historical relational and associational pattern in said information stored in said memory.

308. *(page 6, line 25 to page 7, line 10)* A data structure according to claim 307, wherein the transduced data objects correspond to the input data objects which further correspond to the memory data objects such that context of the characteristics is encoded.

309. *(page 6, line 25 to page 7, line 10; page 8, line 19 to page 16, line 15; page 21, line 9 to page 23, line 26)* A data structure according to claim 308, wherein the organization of the memory data objects of memory corresponds to and represents the context of the input data objects which further corresponds to and represents the transduced data objects which further corresponds to and represents the context of the characteristics.

310. *(page 9, lines 4-25; page 22, line 34 to page 23, line 26)* A data structure according to claim 307, wherein the transducer has n levels of subcomponents and is assigned a master memory register with n + 1 sub registers in a heirarchical manner that parallels and corresponds to the n levels of the transducer subcomponents wherein the stream of transduced

data objects from the n th level transducer sub component provides said plurality of input data objects that are stored as memory data objects as a function of time in the n+1 sub register wherein the identity of the memory register encodes the input context which represents the context of the characteristics according to the specific transducer or transducer subcomponent.

311. *(page 9, lines 4-25; page 22, line 34 to page 23, line 26)* A data structure according to claim 307, wherein the transducer has n levels of subcomponents and is assigned a master memory pointer with n + 1 sub pointers in a heirarchical manner that parallels and corresponds to the n levels of the transducer subcomponents wherein the stream of transduced data objects from the n th level transducer sub component provides said plurality of input data objects that are stored as memory data objects as a function of time in the n+1 sub pointer wherein the identity of the memory pointer encodes the input context which represents the context of the characteristics according to the specific transducer or transducer subcomponent.

312. *(page 1, line 32 to page 2, line 14; page 21, line 9 to page 23, line 26)* A data structure according to claim 307, further comprising a predominant configuration data object being a sum of associated ones of said plurality of order formatted data objects.

313. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15; page 22, line 34 to page 23, line 26)* A data structure in a memory for access by a computer program for efficient recognition of a pattern in information comprising data stored in the memory, the data structure comprising:

a plurality of transduced data objects, each of said plurality of transduced data objects providing an input data object representative of characteristics received from a respective one of a plurality of transducers acting

on a signal provided by characteristics encoded as a Fourier series in Fourier space, wherein said input data objects allows associations among and relational pattern of said input data objects by spectral analysis to achieve recognition of a pattern in information, while preserving input context of said input signal including an identity of said respective one of said plurality of transducers.
(input layer 12, Fourier transform processor 22, spectral similarity analyzer 36).

314. *(page 2, lines 15-33; page 8, line 19 to page 16, line 15; page 22, line 34 to page 23, line 26)* A data structure according to claim 313, further comprising a plurality of association data objects, each of said plurality of association data objects being a sum of associated ones of said plurality of input data objects.

315. *(page 16, line 16 to page 23, line 26)* A data structure according to claim 314, further comprising a plurality of order formatted data objects, each of said plurality of order formatted data objects being one of said plurality of association data objects arranged in a hierarchically order of relative degree of association with relevant characteristics of said information with respect to a standard plurality of order formatted data objects.

316. *(page 22, line 8 to page 23, line 26)* A data structure according to claim 313, further comprising a predominant configuration data object being a sum of associated ones of said plurality of order formatted data objects.

317. *(page 22, line 8 to page 23, line 26)* A data structure according to claim 316, further comprising a plurality of activation probability objects, each of said plurality of activation probability objects being assigned to respective said plurality of transduced objects, said plurality of memory data objects, said plurality of input data objects, said plurality of association data objects, said plurality of order formatted data objects and said predominant configuration data object.

318. *(page 22, line 8 to page 23, line 26)* A data structure according to claim 314, further comprising a plurality of activation probability operands based on activation probability parameters, each of said plurality of activation probability operands being assigned to respective said plurality of transduced objects, said plurality of memory data objects, said plurality of input data objects, said plurality of association data objects, said plurality of order formatted data objects and said predominant configuration data object.

319. *(page 22, line 8 to page 23, line 26)* A data structure according to claim 318, wherein said activation probability parameter of each object is based on at least one of historical activation probability parameter or an activation frequency.

320. *(page 22, line 8 to page 23, line 26)* A data structure according to claim 318, wherein an object is activated when said probability operand has a desired value.

321. *(page 22, line 8 to page 23, line 26)* A data structure according to claim 320, wherein said probability operand has a value selected from the set of one and zero.

322. *(page 22, line 8 to page 23, line 26)* A data structure according to claim 321, wherein said desired value is one.